The Workplace Food Environment: Exploring Interventions to Change Behaviours

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Abstract: The Workplace Food Environment: Exploring Interventions to Change Behaviours. Sarah Ann Smith

It is recognised that the workplace is a promising setting in which to deliver health-promoting activities. However, the lack of evidence regarding the role of workplaces and the failure of many interventions to recognise and address the complexity of the work environment has been acknowledged. The research reported in this thesis aimed to better understand what constitutes an effective workplace intervention aimed at changing dietary behaviours. Multiple mixed methods research was used to answer the aims and objectives of this thesis. A quantitative systematic review with meta-analysis plus narrative summary was conducted and identified key theoretical behaviour change techniques underpinning successful workplace dietary interventions. Qualitative interviews with those responsible for delivering workplace interventions in the North East region provided evidence of several inter-linked factors within workplace settings that influence dietary behaviours. Findings suggest that workplaces under financial pressure (austerity) may result in a management decision to close onsite catering and canteens resulting in the workforce relying heavily on external sources of catering and food provision. An exploration of the broader workplace and neighbourhood food environment through onsite observations, gathering audit data, plus further qualitative interviews with food providers and users has begun to identify some simple, cost neutral interventions that are easily implemented that help the workforce engage in healthier dietary behaviours. Results indicate that workplaces are appropriate settings for behaviour change. It is recommended that interventions that aim to improve dietary behaviours in workplace settings must be cost neutral, make use of workplace communication routes, address working patterns and work culture, engage management, provide peer support, and be employee guided. A complex systems approach is most favourable to address the wider context rather than individual behaviour change interventions that can exacerbate inequalities.

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List of Abbreviations

BCT: Behaviour Change Technique
BHWA: Better Health at Work Award
CAI: Choice Architecture Intervention
CALO-RE: Tool for measuring behaviour change techniques
CENTRAL: Cochrane Central Register of Controlled Trials
CINAHL: Cumulative Index to Nursing and Allied Health Literature
CRD: National Institute for Health Research and Centre for Reviews and Dissemination, York
Ebscohost: access to bibliographic databases designed for research
EMBASE: Excerpta Medica database
EPOC: Cochrane Effective Practice and Organisation of Care
ESRC: The Economic and Social Research Council
Fuse: The Centre for Translational Research in Public Health
IGI: Intervention-Generated Inequalities
MECIR: Methodological Expectations of Cochrane Intervention Reviews
MEDLINE: Medical Literature Analysis and Retrieval System Online
MPM: Mobile Produce Markets
MRC: Medical Research Council
NICE: National Institute for Health and Care Excellence
NHS: National Health Service
Ovid: access to online bibliographic databases and academic journals
PHE: Public Health England
PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PROSPERO: International prospective register of systematic reviews
PsycINFO: a database of abstracts of literature in the field of psychology
PubMed: a free search engine for literature
RCT: Randomised Control Trial
SEM: Socio-ecological Model
SES: Socio-Economic Status
TIPPME: Typology of Interventions in Proximal Physical Micro-Environments
TUC: Trade Unions Congress

UK: United Kingdom
UKCRC: UK Clinical Research Collaboration
US: United States
WHO: World Health Organisation

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Smith, S. A., Lake, A. A., Summerbell, C., Araujo-Soares, V. & Hillier-Brown, F. (2016) The effectiveness of workplace dietary interventions: protocol for a systematic review and meta-analysis. Systematic Reviews, 5, 20.

Accepted Conference Abstracts

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Smith, S.A., O'Malley, C., Summerbell, C., Araujo Soares, V., Hillier Brown, F., & Lake A.A (2016) Exploring the feasibility and implementation of workplace dietary interventions: Views of the intervention deliverers. *Obesity Facts, Inaugural European Obesity Summit (EOS) – Joint Congress of EASO and IFSO-EC, Conference Proceedings; 9(Suppl 1): 226.* (Appendix 2)

Presentations

‘A systematic review of the effectiveness of workplace dietary interventions’
European Congress on Obesity (ECO), Conference Theme: ‘Health, Behaviour and Environment’, May 2018
Vienna, Austria
Poster presentation

‘The effectiveness of workplace dietary interventions: results of a systematic review and meta-analysis’
Durham University Postgraduate Research Conference, June 2017
Durham University Queen’s Campus, Stockton-on-Tees, UK
Oral presentation

‘The effectiveness of workplace dietary interventions: results of a systematic review and meta-analysis’
Wolfson Research Institute Health and Wellbeing Conference (WRIHW) June 2017
Calman Learning Centre, Durham University, Durham, UK
Oral presentation

‘The effectiveness of workplace dietary interventions: results of a systematic review and meta-analysis’
3rd Fuse International KE Conference, Conference Theme: ‘Evidence to Impact in Public Health’, April 2016
The Hilton Hotel, Gateshead, Newcastle, UK
Poster presentation

‘Exploring the feasibility and implementation of workplace dietary interventions: views of the intervention deliverers’
Wolfson Research Institute Health and Wellbeing Conference (WRIHW) 2016,

Wolfson Research Institute, Durham University Queen's Campus, Stockton-on-Tees, UK
Poster presentation

'Exploring the feasibility and implementation of workplace dietary interventions: views of the intervention deliverers'
Inaugural European Obesity Summit, June 2016
The Swedish Exhibition and Conference Centre, Svenska Mässan, Gothenburg, Sweden
Poster presentation

Thesis Reflection

Without doubt this PhD has been one of the hardest and one of the most rewarding experiences I have had. Over the past five years there have been challenges, both academically and personally which I feel I have overcome and grown from. Although at times I doubted myself, I have had the unwavering support from my friends, family, and supervisory team that has kept me going. Over time my self-belief grew as a result of their encouragement and now I feel an inkling of sadness that the journey is coming to an end. I have learnt so much over the course of this studentship, in terms of research practice but also about myself.

I started my first job after finishing University as a Research Assistant, working alongside great colleagues, who are now dear friends. I was given so many great opportunities during the first few years of my research life and was surrounded by strong, successful women who inspired me every day. I decided to do a PhD early on in order to advance in my career, but it was the encouragement of my then colleagues that ensured I applied. I had always been interested in the food environment and at the time this was a relatively new area of research that I was passionate about.

I had been fortunate enough to be part of several Systematic Review teams whilst working as a Research Assistant and had gathered many skills during that time but having the opportunity to conduct my own was quite exciting. Little did I know the level of responsibility and commitment it takes. The review was the starting point of the PhD journey, and was conducted to better understand what workplace interventions are currently showing effectiveness at changing dietary behaviours.

The training course I attended at York University on Systematic Reviewing was to date the best I have taken and equipped me with the knowledge of how to approach, plan, and conduct a Systematic Review and Meta-analysis. In practice, I had some of the best systematic review experts in my supervisory team from whom I was able to call upon. I really enjoyed designing the search strategy, and conducting rigorous database searches,

and became more adept at handling larger datasets. My previous experience of reviewing meant I could pre-empt stages and knew what the data extraction would entail. I learnt at this stage that it is really important to keep notes of everything, and to make backups of Endnote files, which I learnt the hard way. The part I learnt the most from was interpreting the results. This was the new bit to me and was the most time consuming and challenging. Although it felt overwhelming at times with the sheer number of studies from the searches, I found the process rewarding and I'm proud of the result.

Using behaviour change techniques and choice architecture interventions during the review analysis helped me develop new skills and understanding of behaviour change methodology and informed techniques used in the rest of the research conducted as part of this thesis. I found this area particularly fascinating, because I started to appreciate the psychology behind changing behaviour and its complexity. I learnt so much whilst undertaking the review, how to plan, collect, and scrupulously analyse and interpret data, as well as develop my skills in writing up the findings. I now have an improved knowledge of what is involved and a greater appreciation of systematic reviewing.

Whilst conducting the systematic review I worked on the qualitative interview study which was designed to better understand what workplace interventions were currently taking place in the North East region and what the views of those delivering them were. The study involved collaboration with Northern TUC, and I was responsible for organising and attending meetings to build a relationship with those that helped me hugely in recruitment to the studies I went on to conduct. I learnt how valuable it is to collaborate with others and I look forward to sharing the results of this work with them.

This study was the first study I applied and was granted ethical approval for. Going through the ethics process, I have gained a greater appreciation and awareness of the ethics of conducting public health research, and not only that, I developed new techniques from the knowledge I gained whilst applying. For instance, the development of in-depth questioning, and qualitative methods of analysis. I went on to further develop my qualitative

analysis skills during this study and I owe a debt of gratitude to my colleagues for helping me to delve into the qualitative analysis and learning new methods of interpreting results. I had conducted qualitative research projects before and I felt confident in my interview technique, which ensured I gathered valuable, in-depth data, but I had limited knowledge of qualitative analysis techniques other than thematic analysis. I was introduced to the SEM and framework analysis during this study and went on to become a more confident and informed qualitative researcher. I have a knowledge and understanding of the broader contextual factors that influence peoples' behaviour, and better understood the behaviour change literature because of this process.

The study revealed that due to austerity, workplace canteens were closing which meant the workforce were forced to access food from other sources, and even more unexpectedly, that those sources of food provision were often mobile vans and drive-by vans in particular. The study findings were unexpected, yet so informative and placed me firmly on a different path for the rest of the PhD. I took forward new skills and knowledge from this study into subsequent chapters of this thesis, and I was proud when this study was successfully accepted for publication.

Following on from the success of the qualitative chapter, it was an exciting but testing time for me. The findings from that study meant that in discussion with the supervisory team, I needed to change direction and the research I had expected and planned to do was no longer required. Instead I was now designing a study to better understand what food is available to the workforce, and who the providers of food to the workforce are. After finding out that the workforce was relying heavily on mobile catering, I incorporated an audit of food availability and choice into the study in order to compare what was available at workplace canteens versus mobile and external catering. I found this stage testing because I thrive off thorough planning, being prepared, and taking my time, and the work at this point demanded I think quickly to devise the next stage of research based on new findings. I learnt that I can work under pressure of time constraints and adapt to unexpected findings. The ethical approval process was smoother as I was

able to apply what I had already learnt from the previous application, and the study was soon underway.

Recruitment was the biggest issue in this study, proving much more difficult than any study I had been a part of. It is difficult to gain access to workplaces, particularly the ones I wanted to engage with on industrial sites, because of the nature of the work and location. They are often closed to the public, and security is impenetrable. Despite these difficulties, I thoroughly enjoyed the data collection for this study, although I clocked up a lot of miles driving around industrial sites in the area. I was able to utilise the skills I'd developed in interview technique to engage with mobile vendors who were easier to access and gathered observational data. I adapted to the situation and developed observational skills and effective note taking on site, in part this was due to having studied the behaviour change literature and choice architecture interventions in the systematic review. I could fall back on those techniques to identify what was happening around me which reinforced my awareness and understanding of food environments and behavioural observations. Having identified choice architecture interventions extensively in the Systematic Review, I enjoyed identifying the interventions in this study because I got to see first-hand what and how they were utilised in food provision that influence individuals' dietary behaviour. Upon completion of this study, I felt I had improved my knowledge and understanding of behaviour change techniques and coding for them, and applied skills I had accumulated throughout the course of the PhD.

I'd like to mention the huge influence my supervisors have had on me and extend my thanks to them. I have been able to draw upon their experiences and expertise which has in turn made me feel a much more capable researcher.

I mentioned at the start of this reflection piece that I faced personal challenges throughout the course of the PhD, and that relates specifically to ongoing chronic illness and the effect it has had on me and my ability to study. I have Crohn's Disease and about 6 months after I started the PhD the condition flared up and was so extreme that I thought I may have to

withdraw. I had the unwavering support, understanding and compassion from my supervision team, for which I cannot thank them enough. They helped make adaptations to my working patterns enabling me to continue to work throughout my treatment, which was at times the most physically and emotionally intense. I worked from home for the majority of the PhD which had its challenges. It can be isolating, being away from the team and fellow students, but I had weekly contact with supervisors and modern methods of communication such as video calling meant we could continue to work together.

I'm immensely pleased and proud that I was able to collect my own data despite the difficulties I was experiencing. I conducted qualitative interviews via telephone whilst housebound, and I collected the observational and audit data as I had improved enough physically by then due to advances in the medical treatments I was receiving. Looking back on that time, it feels like a lifetime ago but to have made it (almost) to the end despite everything, feels even more rewarding.

Two house moves, an operation, a new job and chronic illness had an impact in the time it took to complete this studentship. I was reluctant to write this reflection but again it was my supervisors that encouraged it, and I can see why now. It's quite a cathartic exercise, but more importantly, it has helped me to identify the additional research skills and traits that I have as a result of having gone through this and come out the other side.

Chapter One: Introduction to the Research and Literature

This chapter describes the objectives of this thesis and summarises the background literature that has led to the development of this research. This includes the relationships between work, the workplace and health behaviours, why workplaces are potentially appropriate settings for behaviour change interventions, behaviour change techniques, and an overview of the multiple mixed methods research that was utilised in this body of work.

1.1 Incidence of Non-communicable Conditions and Obesity

Life expectancy worldwide is increasing, and so too are the incidences of non-communicable conditions such as cardiovascular disease, cancer, and diabetes (WHO, 2011). The increasing prevalence of adults who are overweight and obese is continuing to pose a major global public health problem. Recent World Health Organisation (WHO) global estimates show that overall, 39% of adults are overweight and 13% are obese with levels continuing to rise (WHO, 2011). In the UK, the majority of adults in 2018 were overweight or obese (63%). This includes 26% or men and 29% of women who were obese (NHS, 2020).

These conditions share many of the same behavioural risk factors, such as poor diet, lack of physical activity and smoking (Lim et al., 2012), however, the causes are multifaceted as health is influenced by a complex system of determinants. These determinants include individual, cognitive and emotional factors; social and community influences; distal factors such as care systems, living and working conditions (housing, workplaces and schools); and broader societal factors such as socioeconomic status, cultural and environmental conditions (Dahlgren and Whitehead., 2006).

1.2 Rates of Absences Related to Non-communicable Conditions and Obesity

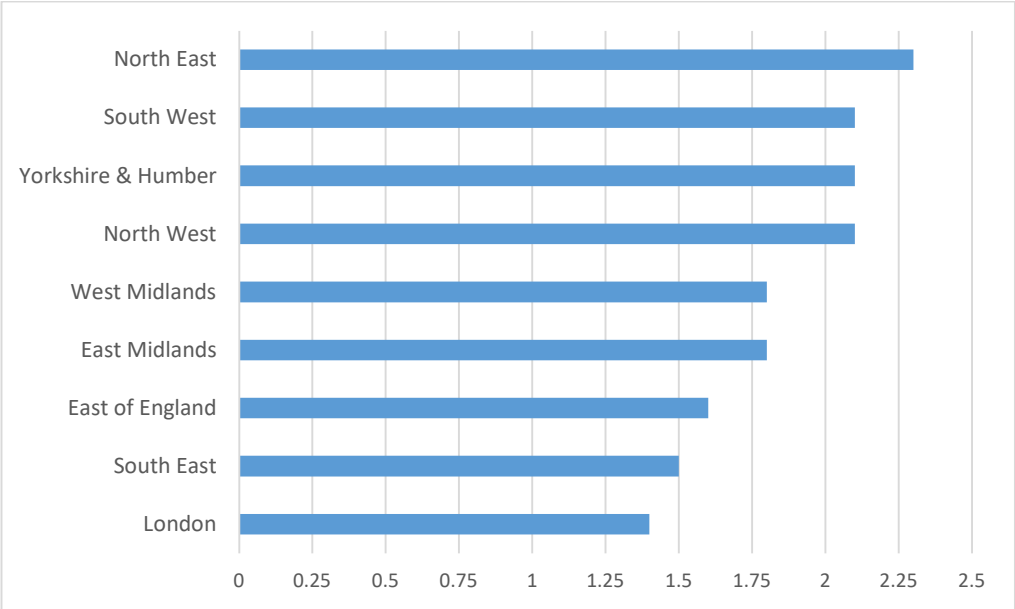
In the UK, around 137.3 million working days were lost through sickness absence or injury in 2016, equivalent to 4.3 days per worker (HSCIC, 2015). Minor illnesses such as coughs and colds caused the greatest number of days lost, around 34.0 million days, followed by musculoskeletal problems such as back pain, and mental health issues such as stress, depression and anxiety accounted for around 15.8 million days lost (11.5%) (HSCIC, 2015; Bajorek and Bevan., 2019).

In the UK in 2010, on average, obese people took four extra sick days per year which for the average company equates to more than £126,000 a year in lost productivity (Craig et al., 2008, NICE, 2016). Estimates of the indirect costs of obesity such as loss of productivity in 2001 were £15.8 billion (Craig et al., 2008). Coupled with the rise in obesity-associated comorbidities, the financial cost of obesity is continuing to rise.

Those who had the highest rates of sickness absences were women, older workers, smokers, those with long-term health conditions, those working in public sector jobs and in the largest organisations (employing 500 or more). The sickness absence rate for part-time workers has been consistently higher than the rate for full-time workers. This can be explained in part by higher numbers of women working part-time, as they also tend to have higher rates of sickness absence (PHE, 2017).

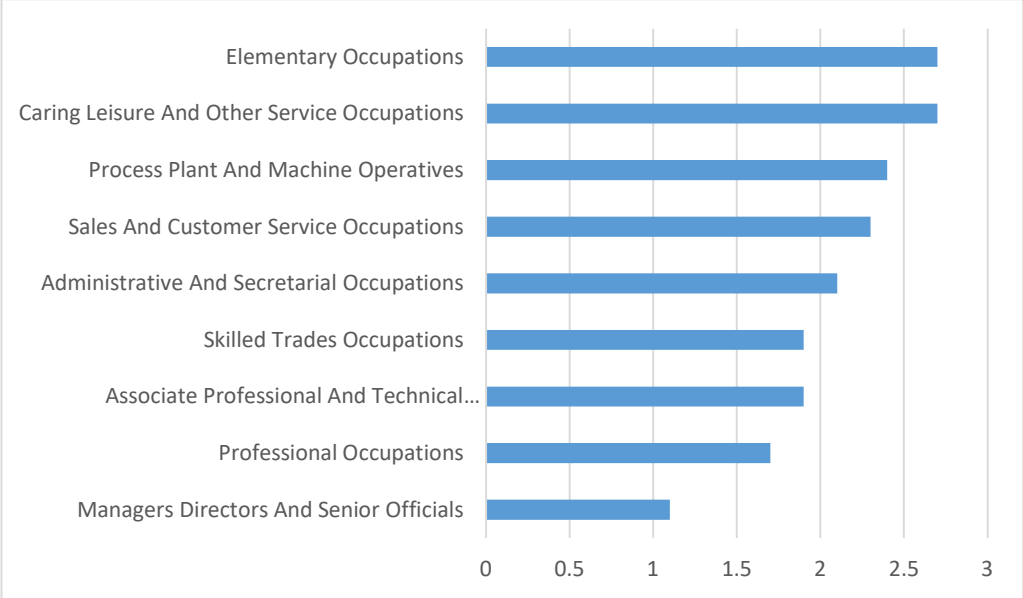
In England, workers living in the North East had the highest rate of sickness absence at 2.3% compared to workers in London had the lowest rate at 1.4% (see Figures 1 and 2).

Figure 1: Sickness Absence Rate by Region, UK (Oct 2015 to Sep 2016)



(Source: Labour Force Survey – Office for National Statistic)

Figure 2: Sickness Absence Rate by Occupation Group, UK, 2016



(Source: Labour Force Survey – Office for National Statistic)

1.3 Cost to the Individual Worker and the Economy

The cost of ill health in the workplace is high. Health inequalities result in high levels of working age ill-health and disability each year, which imposes both human and economic costs. At human level, the impact is reduction in life expectancy and loss of healthy life years.

In England, premature death each year as a result of health inequalities, equates to between 1.3 and 2.5 million extra years of life. (Braun et al, 2015). Findings from the Black Review of working age ill-health (Black, 2008) further highlighted the impact of health inequalities on workers and the economy. Each year, there are substantial lost taxes as a result of ill health due to health inequalities. The British government spend more due to an increase in demand for state welfare support, which is estimated to cost at £20-32 billion per year and increased treatment costs, estimated to be in excess of £5 billion (Marmot et al., 2010).

Steps to reduce health inequalities will benefit society greatly. Individuals will benefit, and economically the country will benefit from reducing losses in tax and national insurance contributions, and a reduction in welfare payments. The British Government are investing in reducing health inequalities. In the ‘Improving Lives: the work, health and disability green paper’, the government outline how they intend on supporting people with disabilities and health conditions to enter and remain in the workplace to help offset the economic costs of ill health on productivity. This also includes steps to support employers to create and promote healthier work environments. However, there are disparities that remain between different groups.

1.4 Behaviour Change Theory and Techniques in Public Health

Supporting health behaviour change is complex, and a variety of factors influence individuals’ behaviour as previously discussed. Interventions that support individuals to change their behaviour in relation to common risk

factors (poor diet, physical inactivity, smoking) are useful, having the potential to improve people's health and wellbeing whilst addressing the economic burden of health care costs of an ageing population who have increased incidences of non-communicable conditions (Araújo-Soares et al., 2019). There are various behaviour change theories that have been used in underpinning health behaviour interventions which will now be discussed.

The Health Belief Model (HBM) (Jones et al., 2015, Tavassoli et al., 2017) was first developed in the United States, and has been adapted to be more diverse both culturally and topically (Griffin, 2012; Scarinci et al., 2012). The model consists of six constructs to predict health behaviours, these include: risk susceptibility, risk severity, benefits to action, barriers to action, self-efficacy, and cues to action (Becker, 1974; Champion & Skinner, 2008; Rosenstock, 1974). The model is popular amongst researchers and widely used in health behaviour interventions particularly around communication showing moderate success (Janz and Becker, 1984; Harrison et al., 1992). Strengths of the HBM include that it was developed by researchers that work in health behaviour research and therefore more likely to be using the model. However, the HBM has significant limitations, the main being not specifying variable ordering (Champion & Skinner, 2008). This means that any relationships between the six variables that show they may moderate or influence one another are not explicitly reported using the HBM. The model variables are also open to interpretation and often reported differently by different researchers. Furthermore, there are key variables that are missing from the model, such as intentions to perform behaviours and social pressures.

The Social Cognitive Theory (SCT) (Bandura,. 2004; McCabe et al., 2015, Stacey et al., 2015) originated as the Social Learning Theory (SLT) in the 1960s by Albert Bandura and was revised and developed into the SCT in 1986. The SCT is an interpersonal theory focusing on the mutual interactions between core determinants such as persons, behaviours, and the perceived environmental barriers and facilitators that influence behaviour. (Glanz et al., 2008). The SCT emphasises that personal characteristics and the

environment influence behaviour and has shown effectiveness in interventions promoting dietary behaviour change (Rolling and Hong., 2016; Rinderknecht and Smith., 2004; Powers et al., 2005; Najimi and Ghaffari., 2013). The SCT considers many levels and has been widely used in health promotion interventions, with a particular strength in recognising the influence of both individuals and environment on behaviour. However, the model assumes that changes in environment will automatically change people's behaviour and being based only on the interplay of three factors (person, behaviour and environment) the theory does not identify which factor was the more influential (Powers et al., 2005). Furthermore, in a practical sense the SCT can be difficult to use thus impacting on the validity and usefulness of the data (Rolling and Hong., 2016).

The Theory of Reasoned Action (TRA) was developed by Martin Fishbein and Icek Ajzen (Ajzen and Fishbein., 1980; Fishbein and Ajzen., 1985; Ajzen 1991) and assumes that behaviours are under individuals' voluntary control. The focus is on determining the likelihood that an individual will engage in a specific behaviour based on the interplay of attitudes, subjective norms, and intentions (Sheppard et al., 1988). The TRA has shown to be useful in interventions aimed at changing dietary behaviour in adolescents and young adults (Hackman and Knowlden 2014) and aimed at improving dietary choices (McDermott et al., 2015). However, more research is required to identify the TRA method most effective at modifying dietary behaviours. The main limitation of the TRA is that it assumes that if an individual is motivated, they will engage in a particular behaviour, but fails to recognise that other factors exert strong influence on the ability to engage in a behaviour. The impact of other factors is not considered at all with the TRA.

Previous models as outlined above have recognised the importance of other influences on behaviour, but similarly to the TRA, have not proved to be the most effective for this body of research. Upon further investigation, the most relevant model is the socio-ecological model (SEM) (Hirsch et al., 2016, Odum et al., 2016, Quick et al., 2017) which will now be discussed in more detail.

1.4.1 The Socio-Ecological Model (SEM)

The SEM is a particularly effective model in health research as it is an approach that offers a broader perspective, recognising that there are not only individual factors that influence a person's behaviour, rather there are broader influences such as societal factors, and the impact of an individual's environment on behaviour that need to be considered.

Introduced as a theoretical model in the 1970's, the SEM was further developed and is frequently used in a variety of contexts to understand human behaviour (Marlier et al., 2015, Martin-Biggers et al., 2018, Pearson et al., 2017, Ssewanyana et al., 2018). The SEM integrates levels of influence, including intra-and interpersonal factors; community and organisational factors; and public policies. The levels of influences are listed and described in Table 1.

The model is characterised by a series of nesting circles and considers the interplay between these levels. Figure 3 shows most recent version of the SEM. The overlapping circles of the model demonstrate how factors at one level influence factors at another level, and ultimately the individual (Bronfenbrenner, 1989, Robinson, 2008). The systems closest to the individual, are considered the most influential and involve interactions with close family, siblings and/or partners. The remaining systems are those that the individual comes into contact but not direct contact with, and therefore have less of an influence, these include work, school, neighbourhood environment, community and organisations. These interactions can have both a beneficial and/or detrimental influence on an individual's behaviour.

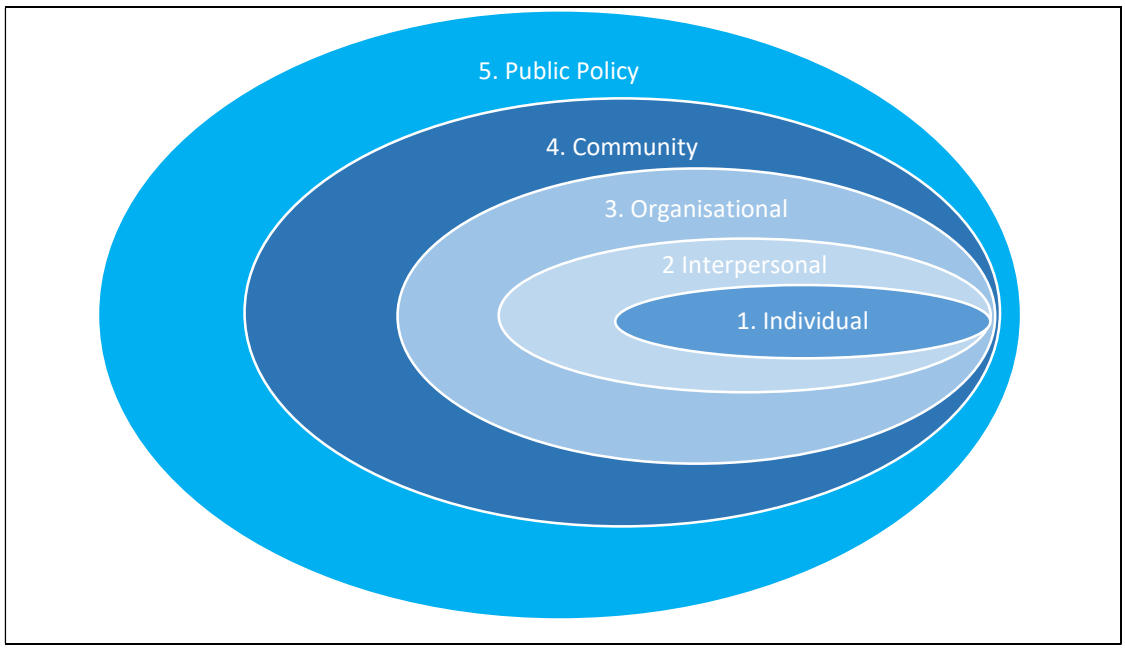
The SEM provides a useful framework for understanding the broader facilitators and barriers that impact on individuals' behaviours (Robinson, 2008). However, the SEM does not allow us to determine the degree of which each system effects behaviours. Despite this, the SEM is an effective model that can be used to inform Behaviour Change Intervention (BCI) development and was deemed most suitable for this body of research.

Table 1: The Levels of Influences in the Socio-Ecological Model (SEM)

Levels of influence	Description
Intrapersonal	Individual characteristics that influence behaviour, such as knowledge, attitudes, beliefs, and personality traits
Interpersonal	Interpersonal processes, and primary groups including family, friends, peers, that provide social identity, support and role definition
Organisational	Rules, regulation, policies, and informal structures, which may constrain or promote recommended behaviours
Community	Social networks and norms, or standards, which exist as formal or informal among individuals, groups, and organizations
Public policy	Local, state, federal policies and laws that regulate or support healthy actions and practices for disease prevention, early detection, control, and management

(Adapted from (Robinson, 2008))

Figure 3: The Adapted Socio-Ecological Model (SEM)



(Adapted from (Jepeal et al., 2014))

When trying to change behaviour, it is paramount that we consider what precedes the behaviour we are trying to change and acknowledge the complexities of and interplay between individual, social, political, economic factors and considers preceding patterns and practices in order to inform how to change things (Kelly and Barker, 2016). Various methods exist to capture behaviour change techniques in interventions. Two of the most relevant to nutrition research and this PhD are now discussed in more detail.

1.4.2 Behaviour Change Techniques: CALO-RE

Methods of reporting intervention content in research studies is generally poor and due to diversity of terminology and reporting, results are not replicable or in a format that can easily be compared. In response, a standardised, 26-item taxonomy of behaviour change techniques was devised (Abraham and Michie., 2008) to specify content of interventions that contribute to effectiveness. The tool was used extensively in Systematic Reviews, reports, study protocols and published papers. However, there were areas for improvement identified including adding newly identified BCTs in systematic reviews (Michie et al., 2009). In order to optimise the reporting and scientific study of behaviour change interventions, the taxonomy was subsequently improved by a collaborative study of three different research centres and two independent research studies. This led to clarification of the definitions and labels of behaviour change techniques, identifying and adding new techniques, whilst improving the practicality of the tool, it's usefulness and validity. The resulting CALO-RE taxonomy (Michie et al., 2011) is a 40-item taxonomy of behaviour change techniques (BCTs) with labels and definitions for physical activity and healthy eating interventions.

The CALO-RE taxonomy has been widely used in complex behaviour change interventions to identify and evaluate the potentially active intervention components of dietary interventions (Gardner et al., 2011; Hills et al., 2013; Lara et al., 2014). The taxonomy has been used in intervention studies conducted in workplace settings and shown to be effective at identifying techniques to change dietary behaviour amongst staff in school

settings (Nathan et al., 2020) and office workers. Furthermore, the taxonomy has proven useful in Systematic Reviews of interventions targeting physical activity and/or healthy eating behaviours (Buckingham et al., 2019; Olander et al., 2013; Plow et al., 2014).

Strengths of the CALO-RE taxonomy are that it has undergone scrutiny and development, increasing its reliability and ensuring reliable reporting and evaluating of evidence. The Abraham and Michie (2009) taxonomy underwent rigorous testing by two independent research teams in which specified criteria were used to identify areas for improvement. The CALO-RE taxonomy requires expanding however, in line with authors recommendations, to take account of the broader environmental context and choice architecture interventions. In summary, the CALO-RE taxonomy remains comprehensive, with clear labels and definitions, with very little overlap, and has proven effectiveness in identifying behaviour change components in dietary intervention studies. For these reasons it was selected for use in this body of research.

1.4.3 Choice Architecture Interventions: TIPPME

It is now widely accepted that the physical environment around us can exert influence on our decision making and choices. There is an increasing body of evidence on altering aspects of the physical environment to change health behaviours at population level and several research efforts have aimed to detail and categorise these.

The behaviour change technique taxonomy (Michie et al., 2013) aimed to describe behaviour change techniques that included changes to the physical environment but did not manage to classify such interventions. The intervention mapping approach (Kok et al., 2016) describes a series of steps to consider during intervention development and includes ‘nudging’ as a possible technique for changing the underlying determinants of behaviour. The main limitation with this approach is failure to identify the specific components or content of interventions.

Further attempts to break down the concept of interventions such as ‘nudging’ and ‘choice architecture’ (Johnson et al., 2012; Munscher et al., 2016) have not succeeded in describing the details of how to change physical environments. Studies have been conducted with the aim of categorising the physical environmental cues that are believed to influence behaviour (Bitner 1992; Turley and Milliman., 2000; Wadhera and Capaldi-Phillips., 2014; Wansink 2004), but the results have provided insufficient detail and have not been robustly developed or assessed.

The ANGELO (analysis grid for environments linked to obesity) framework (Swinburn et al,. 1999) is a conceptual model for understanding obesogenic environments. The framework breaks the observed environment into categories, these include environment size (micro and macro): physical environment (availability), economic environment (costs), political (rules or policy), and sociocultural (attitudes and beliefs). The framework has proved to be a flexible tool during piloting at population level and was effectively applied to fast food outlets (Swinburn et al., 1999). Whilst helping to rate components of the environment identifying what should be prioritised in future research, the framework was not particularly useful on a practical level and required further development on a larger population.

Despite the research efforts outlined above, a suitable framework that can define and conceptualise the characteristics of environmental interventions did not exist, resulting in an inability to synthesise the findings leading to a lack of clarity of the growing evidence base. The tool TIPPME (typology of interventions in proximal physical micro-environments) was developed (Hollands et al., 2017) to provide a framework to help classify and describe interventions related to ‘choice architecture’ and ‘nudging’ thus allowing for more robust analysis of findings within and between studies. TIPPME draws upon the conceptual distinction in the ANGELO framework between macro- and micro-environments. The interventions classified in TIPPME involve changing the characteristics of products and/or the *micro*-environment in which they are provided such as shops, restaurants, cafes and workplaces.

Examples include altering portion size, changing the positioning of products in the canteen, providing healthier alternatives, placement of products etc. TIPPME is the most effective tool to date for gathering information on interventions that alter physical micro-environments to change health related behaviour such as selecting, purchasing and consumption of food products (Cohen et al., 2015), the effectiveness of 'nudging' interventions in food purchasing environments i.e. restaurants, cafes and supermarkets (Harbers et al., 2020) and influencing consumers food choice (Broers et al., 2017; Hollands et al., 2019; Bucher et al., 2016).

Strengths of the TIPPME tool include the rigorous testing and development of the tool. Upon identifying a need for a typology of micro-environment interventions, TIPPME went through seven stages of development before a final version was agreed upon. Starting with a large-scale systematic scoping review, the tool went on to be scrutinised by experts who fed back via workshops. After identifying conceptual issues that undermined validity and usefulness the tool was revised and passed two reliability testing exercises involving experts coding intervention descriptors and then a further coding of full text papers. Further reliability testing took place with individuals responsible for delivering environmental interventions and therefore more likely to use the tool. The outcome was a systematic, reliable method of characterising choice architecture interventions that can be used by researchers and those who are responsible for food provision in commercial, public sector and domestic environments. For the reasons outlined above, the TIPPME tool was selected for use in this body of research.

1.5 Workplaces as a Suitable Setting for Behaviour Change Interventions

In response to the rising global trend in obesity and overweight, the WHO has developed the "Global Action Plan for the prevention and control of non-communicable diseases 2013–2020" (WHO, 2008) which aims to build on the WHO Framework Convention on Tobacco Control and the WHO Global

Strategy on Diet, Physical Activity and Health. The plan will contribute to nine global targets to be attained in 2025, including a halting of the global obesity rates to those of 2010. There is a global need to develop and evaluate dietary interventions conducted in various settings to address this 'globesity' problem (Craig et al., 2008, NICE, 2016).

Amongst others, the workplace environment has been identified as an ideal setting for health behaviour interventions (Lake et al., 2004) in which to tackle diet and lifestyle behaviours (Black, 2008). Workplace interventions have the potential to target a large proportion of the adult population particularly as those in employment can spend up to two thirds of their day at work (Chu et al., 2000, Pratt et al., 2007, WHO, 2003, Zapka et al., 2007). There are a wide range of demographics at one workplace, and a far-reaching intervention effect influencing other family members, children, and within the wider community. Modern day communication channels such as electronic mail and staff intranet make intervention delivery in workplaces easier and efficient. Furthermore, prevalence of overweight and obesity varies by age, with higher prevalence in older age groups amongst both men and women (WHO, 2015). With an aging population and a greater proportion of people working past retirement age, the positive impact of workplace interventions could be seen across the working lifespan.

A number of workplace-based interventions have attempted to change dietary behaviour (Beresford et al, 2000; Elliot et al, 2007; Engbers et al, 2006; Verweij L, 2009; WHO, 2008). Techniques such as education, counselling and alterations to the physical environment of the workplace have all been used in an attempt to modify dietary intake (Lassen et al, 2004; Sorensen et al, 1999). Systematic reviews into workplace interventions have shown that environmental modifications and education in relation to diet, physical activity, and lifestyle factors have, in general, lead to moderate improvement in dietary intake (Geaney et al, 2013; Maes et al, 2012; Ni Mhurchu et al, 2010). Studies that have focussed on environmental changes and education have been shown to have positive short term effects on

dietary intakes of participants' (Geaney et al., 2016, Mackison, 2016, Volpe, 2015).

The scope of workplace interventions to address overweight and obesity is great, with the potential to impact on individuals across society; however, the greatest benefit may be for those in full-time employment who can access onsite catering and interventions which are typically delivered during daytime working hours. Those who work part-time, particularly women, or during evenings and during the night may not have the same access as full-time workers; therefore, there is the risk of creating health inequalities across organisations. Despite the potential, little is known about the factors that impact on the feasibility and implementation of health behaviour interventions in workplace settings.

As places where people spend time and eat meals, workplaces are environments which are potentially obesogenic. As evidenced in The Foresight Report, behavioural and environmental factors impact on the health behaviours of individuals, potentially leading to NCDs including obesity, and the workplace may well be one such environment (Foresight, 2011). Increasing evidence suggests that workplaces are environments that can perpetuate obesogenic behaviours. Working conditions and the nature of work, amongst other factors, have been shown to impact on workers' health and wellbeing. Employees working long hours in hostile working environments may be at a higher risk of becoming overweight or obese particularly if they are working more than forty hours a week (Yarborough et al., 2018; Strickland et al., 2013). The workplace food environment with inadequate eating facilities, cooking or reheating facilities, and places to sit and eat, rarely offer healthy food choices (Nobrega et al., 2016, Bajorek and Bevan., 2019).

The influence of 'non-home' environments on dietary behaviour, such as the surrounding workplace environment, has been acknowledged with evidence to show that access to healthier foods near to workplaces is associated with healthier food consumption amongst female workers (Thornton et al., 2013; Burgoine and Monsivais., 2014). In addition, those in employment may be

relying more on food stores in closer proximity to, or on the way to and from, their place of employment as not only a place to purchase and eat food whilst in work, but also where they conduct their main food shopping (Kerr et al., 2012) thus having a broader impact on household and family food provision. To better understand dietary behaviours of the working population, more assessment of these environments is a priority.

Despite the obvious potential of workplace interventions targeting health behaviours as, few UK-based workplace intervention studies have been published. Fewer still focus on the practicalities and implications when running an intervention within the workplace setting (WHO, 2003), and there is still uncertainty about the effectiveness of dietary interventions in the workplace. Research exists that provides an overview of organisational workplace interventions, however there is limited information on practice or implementation. The lack of evidence regarding the role of worksites and in particular the failure of many interventions to recognise and address the complexity of the work environment has been acknowledged. Furthermore, there is a need to evaluate any differential impacts of interventions by socio-economic status (Hillier-Brown et al., 2014, Lake et al., 2016).

1.6 Future Approaches Required

The Marmot review justifies that reducing health inequalities is vital for the economy, and the potential cost of inaction is significant (Marmot et al., 2010). Action taken to reduce health inequalities will benefit society hugely. Importantly the review highlights the fair distribution of health, well-being and sustainability are important social goals. Economic benefits will be seen from a reduction in productivity losses due to ill health, reduced tax revenue, higher welfare payments and increased treatment costs.

There is a need for interventions that have a whole systems approach that aim to reduce health inequalities across all the social determinants of health to begin to tackle the social gradient in health. To reduce the steepness of

the social gradient in health, interventions must be universal and ensure they do not contribute to inequities in health. More needs to be understood on the effectiveness and implications of interventions to promote healthier dietary behaviours in the workplace to facilitate an understanding of what works, why and how. This will inform successful local delivery of interventions. Identifying theoretical models of behaviour change using combinations of techniques as outlined in this chapter, would be a notable contribution to the evidence and inform the development of future interventions and research into tackling workplace obesogenic environments and promoting positive dietary behaviour change in workplaces.

1.7 Summary of the Literature

The population worldwide is ageing. Simultaneously there is an increase in the incidence of non-communicable conditions and obesity rates. Cost to individuals and to the economy are substantial. Workplaces are potentially ideal settings for health behaviour change interventions, and current interventions show promise but tend to focus on environmental factors without identifying why or how they are effective. The lack of evidence regarding the role of workplaces and in particular the failure of many interventions to recognise and address the complexity of the work environment has been acknowledged. What remains unclear and warrants investigation is identifying the key components that underpin successful behaviour change interventions in workplace settings and identifying the practicalities of designing and implementing behaviour change interventions.

1.8 Objectives of the Research

The research documented in this thesis was undertaken within the School of Medicine, Pharmacy and Health at the University of Durham between the years of 2014 and 2017. The research comprises of three main research

studies that aimed to identify what constitutes an effective dietary workplace intervention. The aims of the research included:

1. To identify the effectiveness of current dietary interventions in the workplace to facilitate an understanding of what works, why, how, and for whom.

2. To identify key components of interventions and theoretical models of behaviour change, underpinning successful (and unsuccessful) dietary interventions in the workplace.

3. To explore the views of those involved in commissioning, designing and delivering dietary interventions in North East workplaces.

4. To identify what food is available to the workforce (i.e. in the canteen, vending machines, mobile caterers) and explore the views of food providers and users (the workforce) about food provision.

5. To gather data on nutritional quality of the food available to the workforce.

6. To explore factors that will inform the development of interventions aimed at changing dietary behaviours in the workplace setting.

1.9 The Thesis Structure

This thesis consists of three main studies that were conducted to explore food provision and dietary behaviour in workplace settings and the workplace neighbourhood. These included:

1) A systematic review and meta-analysis of the effectiveness of workplace dietary interventions

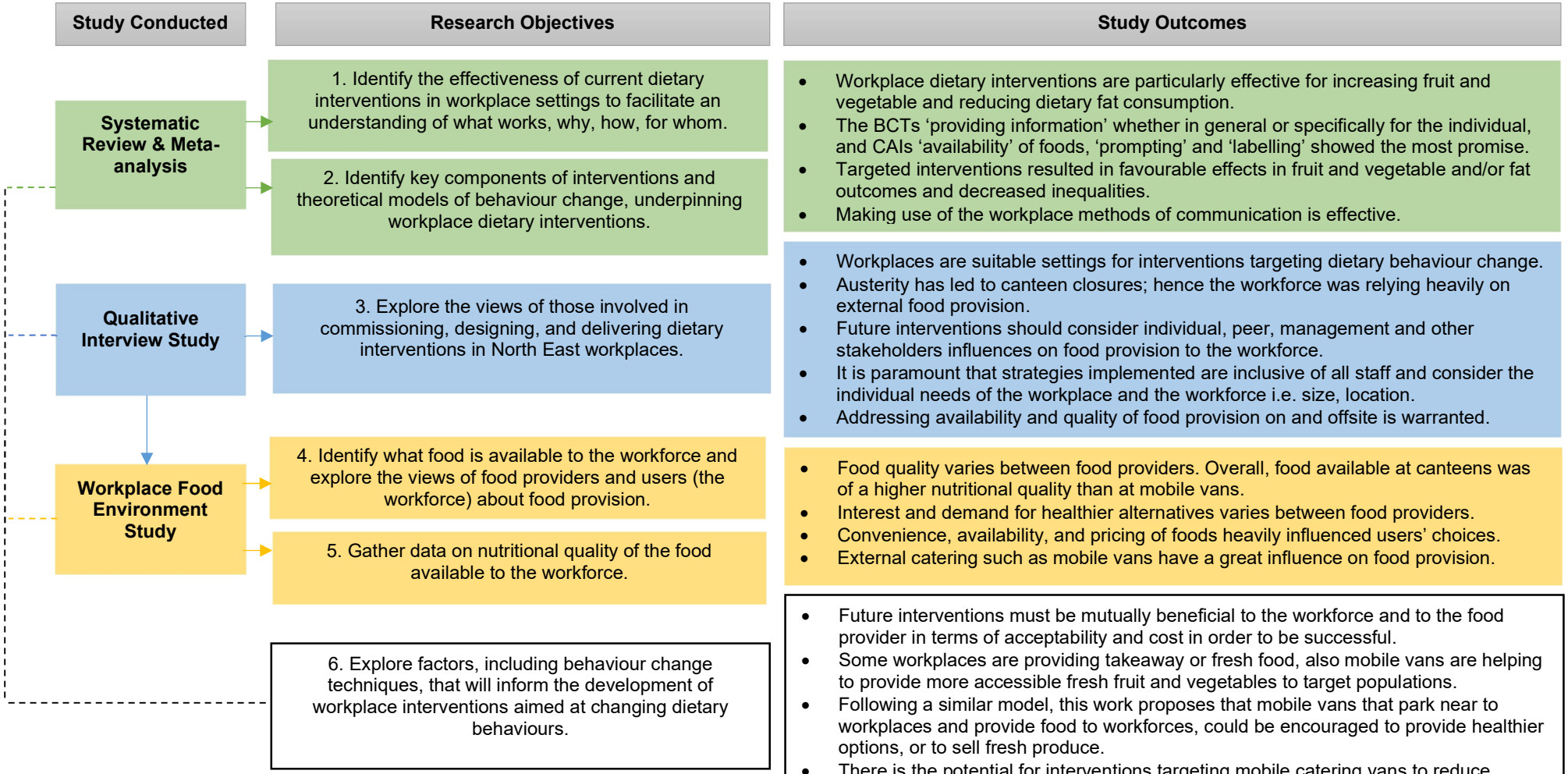
2) A qualitative study exploring the views and experiences of those designing and implementing dietary interventions in workplaces in North East England

3) An exploration of the broader workplace and neighbourhood food environment and perceptions of those providing food to the workforce and users (the workforce) accessing food provision.

The systematic review and the qualitative exploration study commenced simultaneously (concurrent mixed methods sampling). The study exploring the broader workplace and neighbourhood food environment was borne from the findings of the qualitative study (sequential mixed methods sampling).

Figure 4 shows the inter-relationship between the three studies.
The following chapters aim to detail the findings of the research studies outlined above and show how these findings collectively help to inform a systems-based approach to developing future interventions aimed at changing dietary behaviours in the workplace.

Figure 4: The Inter-Relationship Between the Studies Conducted as Part of this Research



Chapter Two: Systematic Review of the Effectiveness of Dietary Interventions in the Workplace Setting

The review is registered with PROSPERO (International prospective register of systematic reviews) at the National Institute for Health Research and Centre for Reviews and Dissemination (CRD) at the University of York (registration number: CRD42015015175) (Appendix 3). The protocol for this review is published in Systematic Reviews (Smith et al., 2016) (Appendix 4) and a manuscript is in draft for submission early 2020.

Despite the obvious potential of workplace interventions targeting health behaviours as highlighted in Chapter 1, few UK-based workplace intervention studies have been published. Fewer still focus on the practicalities and implications when running an intervention within the workplace setting (WHO, 2003), and there is still uncertainty about the effectiveness of dietary interventions in the workplace. This systematic review aimed to summarise the relevant evidence on the effectiveness of interventions promoting healthier dietary behaviours in workplace settings. Furthermore, this review aimed to facilitate an understanding of what works, why and how by identifying key components of and examining the theoretical models of behaviour change underpinning successful dietary interventions in the workplace.

This chapter includes the methodology and findings of the review, including details on the search strategy, data extraction and quality assessment tools used, as well as details on the meta-analysis, characteristics of the included studies, and risk of bias outcomes.

2.1 Objective of the Review

The objective of this systematic review was to identify, critically appraise, and summarise the relevant evidence on the effectiveness and implications of

interventions to promote healthier dietary behaviours in the workplace. In particular:

- What workplace-based interventions are effective for reducing energy intake, reducing fat intake, reducing salt intake, reducing consumption of sugar sweetened beverages and/or sweets?

- What workplace interventions are effective for increasing fruit and/or vegetable consumption, and/or increasing fibre intake?

- What workplace interventions are effective at reduction in and/or control of food portion size?

- Are some subgroups of the population more responsive to such interventions i.e. older versus younger employees, men versus women, shift workers versus non-shift workers? Manual vs professional?

- Are changes in employee wellbeing, productivity and absenteeism observed in response to dietary interventions in the workplace?

2.2 Methods

2.2.1 Search Strategy

One overarching search (amended to suit syntax requirements) was carried out to identify studies of relevance (see Appendix 5 for search strategy in full). The electronic databases MEDLINE (Ovid), EMBASE (Ovid), CINAHL (Ebscohost), PsychINFO (Ebscohost), CENTRAL (Cochrane Central Register of Controlled Trials), PubMed were searched from database inception to May 2015, with an update search conducted in March 2018. Reference lists of included studies and relevant systematic reviews were searched for any additional papers not picked up by the database searches. Known topic experts in a variety of countries were contacted via email to

enquire of any additional interventions they were aware of that may be of relevance to this review.

Prior to conducting the review a scoping search was carried out to ensure adequate sensitivity of the search strategy. The search was piloted in MEDLINE (searched 27th April 2015) and resulted in 2069 hits that included five indicator papers identified prior to running the search.

2.2.2 Selection of Studies

Titles and abstracts of all studies were independently screened to identify those that are relevant and meet the inclusion criteria. A second reviewer (FHB) screened a random 10% sample of titles and abstracts. Full texts of each included paper were obtained and reviewed to determine which papers to include in the review, based on the inclusion and exclusion criteria. A second reviewer (FHB) screened a random 10% sample of the full texts.

The inclusion criteria for the review were:

- Adults of all gender, socioeconomic status and nationality, with a mean age of 16 years or older who are employed at the worksite.

- Interventions that target dietary behaviours that are based in any workplace in any country.

- Studies that are randomised controlled trials (RCTs)

- Studies with duration (intervention plus follow-up) of 12 months or over.

- Studies with a comparator (there was no restrictions on the type of comparator used in the study).

Included studies had at least one primary outcome of interest. Primary outcomes consisted of diet and nutritional intake factors such as; Change in vegetable consumption; Change in fruit consumption; Change in fruit and vegetable consumption; Change in consumption of sugar sweetened beverages; Change in consumption of 'other foods'; Catering/food sales data); a nutritional intake outcome (Change in energy intake; Change in fat intake; Change in salt intake; Change in fibre intake; Change in portion size, change in food environment. Improvement in productivity and reduction in absenteeism were also extracted. The reason for focussing on these specific dietary behaviours are that these are dietary components that are a particular target for public health intervention (WHO, 2020) and improvement with intakes is linked to incidences of NCD and chronic health conditions.

The review included various methods of outcome measurement, for example, but not restricted to, self-report, researcher observations, photographs of food portions, weighed intake. Where reported data on differential effects between specific populations (for example, older versus younger employees, shift workers versus non-shift workers, manual versus professional, socioeconomic status, ethnicity) were included. This review was conducted in line with the PRISMA checklist (Moher et al, 2009), see Appendix 6.

2.2.3 Data Extraction

Data extraction was conducted by one reviewer (SAS) with a second reviewer (FHB) independently verifying the results. Any discrepancies were resolved by discussion between the two reviewers, and if a decision was not met, a third reviewer was consulted to reach consensus. Electronic data extraction forms (pre-established to ensure consistency and accuracy between reviewers) were manually completed. The data extraction form was piloted using a sample of studies and amendments made, and then a second phase of pilot testing conducted. Details of the data extraction can be found in Appendix 7.

Data extraction included:

- General study characteristics (author, year of publication, location study was conducted, study name if applicable).

- Participant characteristics (gender, age, type of worker (blue collar, white collar etc., any health inclusion criteria (BMI, heart disease, predisposed to diabetes etc.)

- Study methods (intervention duration, dates of recruitment to the study, dates for follow-up).

- Relevant study outcomes for analysis (primary outcomes as listed above)

- Theory underpinning intervention design

- Behaviour Change Techniques (CALO-RE taxonomy (Michie et al., 2011) and described in detail in the next section of this chapter).

- Choice Architecture Interventions (TIPPME (Hollands et al., 2017) and described in detail in the next section of this chapter)

- Intervention details

- Economic cost (purchasing patterns, productivity, absenteeism) and funding source.

- Risk of Bias assessment using the Cochrane Risk of Bias tool (Higgins et al., 2011).

2.2.4 Behaviour Change Techniques Employed in Included Studies

To identify Behaviour Change Techniques (BCTs) each of the included studies' intervention details were coded using CALO-RE, a 40-item taxonomy of standardised BCT definitions (Michie et al., 2011). CALO-RE has been used in several studies and is most suitable for use in health interventions for physical activity and dietary intake. The CALO-RE taxonomy does not include interventions aimed at changing the physical food environment, so nine codes of choice architecture interventions (CAI) in micro-environments identified in a previous study (Holland 2017) and outlined in Table 1, were used to code the included studies' interventions. The final checklist of BCTs and CAIs (TIPPME) can be found in Appendix 8.

One of the PhD supervision team (VAS) is a Health Psychologist and provided training and support to the two reviewers coding the papers (SAS and FHB). Training involved two papers being independently coded for BCTs by the two reviewers (SAS and FHB), who then discussed any discrepancies with a third reviewer (VAS). After this process, there was an agreement on how to code for BCTs. SAS coded all studies, and FHB coded 10% of the studies. Both reviewers agreed on the coding of the final sample of included studies. Behaviour change theories when stated were also recorded.

Table 2: Choice Architecture Interventions in Micro-environments (Hollands et al., 2017)

41. Primarily alter properties of objects or stimuli: AMBIENCE
Alter aesthetic or atmospheric aspects of the surrounding environment
42. Primarily alter properties of objects or stimuli: FUNCTIONAL DESIGN
Design or adapt equipment or function of the environment
43. Primarily alter properties of objects or stimuli: LABELLING
Any labelling or endorsement information to product or at pint-of-choice
44. Primarily alter properties of objects or stimuli: PRESENTATION
Alter sensory qualities or visual design of the product
45. Primarily alter properties of objects or stimuli: SIZING
Change size or quantity of product

46. Primarily alter placement of objects or stimuli: AVAILABILITY Add behavioural options within a given micro-environment
47. Primarily alter placement of objects or stimuli: PROXIMITY Make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort
48. Alter both properties and placement of objects or stimuli: PRIMING Place incidental cues in the environment to influence a non-conscious behavioural response
49. Alter both properties and placement of objects or stimuli: PROMPTING Use non-personalised information to promote or raise awareness of a behaviour

2.2.5 Risk of Bias Assessment

The Cochrane Risk of Bias Tool (described in Handbook version 5.1.0) (Higgins et al., 2011) was used. The tool assesses sources of bias in randomised controlled trials including selection bias; performance bias; detection bias; attrition bias; reporting bias; other biases (bias that is not addressed elsewhere in the tool relating to trial design, in particular circumstances or settings).

The tool comprises a judgement and a comment for each potential source of bias in each study deemed either *'low risk',* as *'high risk,* or as *'unclear risk'* (indicating either lack of information or uncertainty over the potential for bias). Risk of bias assessments were conducted by SAS and checked by FHB and as before, any discrepancies were resolved by discussion between the two reviewers.

2.2.6 Data Synthesis

2.2.6.1 Meta-analysis

Data were combined for meta-analysis when the following criteria were satisfied in two or more studies:

1. Same study outcome investigated (e.g. fruit consumption, vegetable consumption etc.)

2. Same outcome measure or measure that could be converted (grams/day, score/day, serving, portion, MJ/day)

3. Data for both intervention and control group reported

4. Reported mean intake and standard deviation

Data synthesis was carried out in Review Manager (Cochrane Collaboration Software). Important heterogeneity existed, so random-effect analysis was carried out.

2.2.6.2 Narrative Synthesis

A narrative synthesis of the included studies was conducted, and outcomes were individually summarised based on statistically significant changes as a result of an intervention, as compared with control conditions. We classified an intervention as 'successful' at improving dietary behaviours at two levels: 1) if one or more dietary outcomes measured were improved and 2) if at least half of the dietary outcomes measured were improved. This allowed trends to be identified for both small and more substantial positive intervention effects in cases where an intervention targeted, or was evaluated based on, multiple dietary behaviours. The BCT and CAI data was synthesised to identify the frequency (%) of use of each BCT and CAI in the workplace dietary interventions generally, and in interventions classified as successful (i.e. identified the proportion of interventions using each BCT/CAI that were classified as successful).

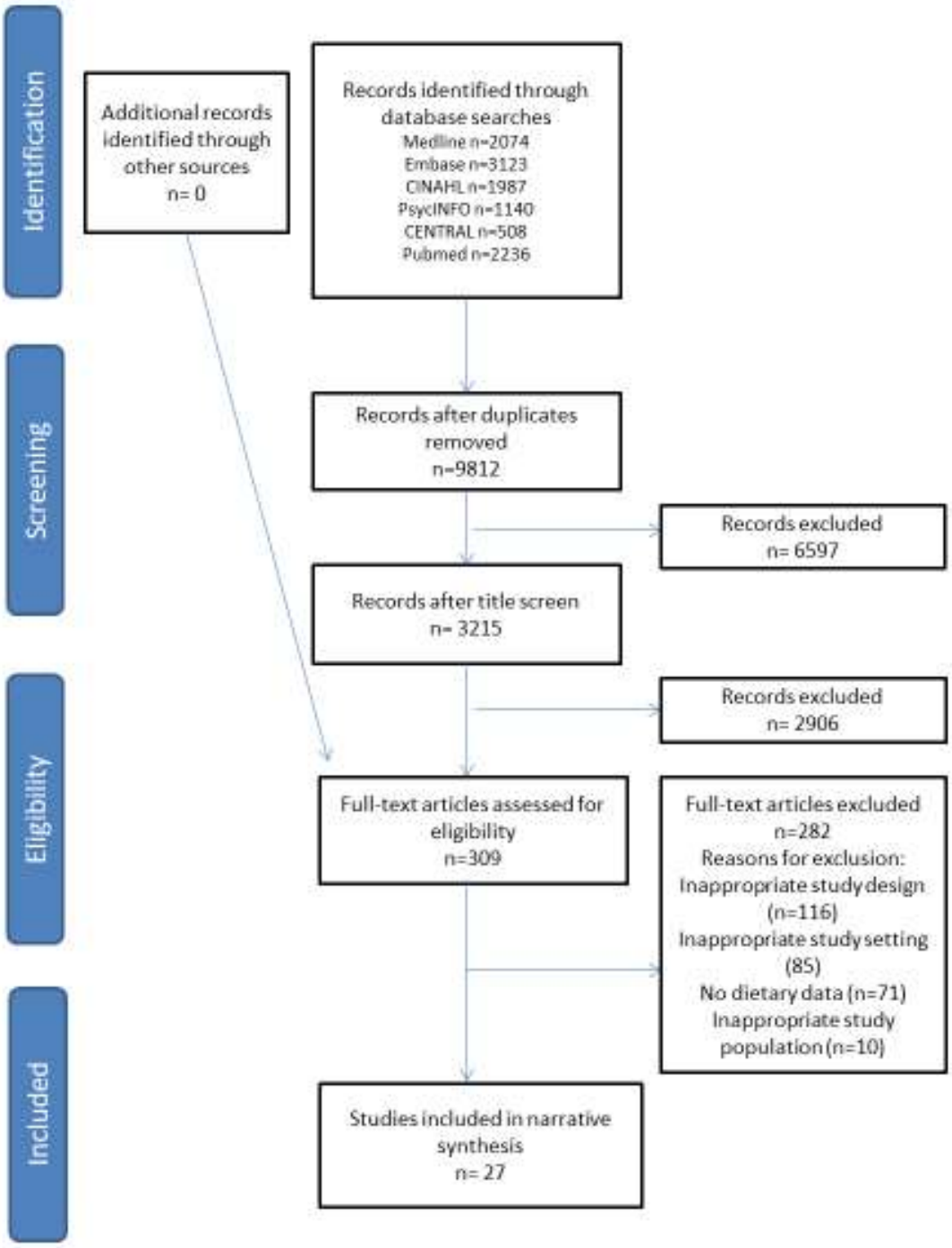
2.3 Results

Search and Screening Results

The electronic searches identified 9812 potentially relevant records following deduplication. 6597 records were excluded based on title screening, 2906 were excluded after abstract screening. 309 full texts were screened of which

282 were excluded. A total of 27 studies were eligible for inclusion in the review (see Figure 5).

Figure 5: PRISMA Statement Flow Diagram of Search Results



2.3.1 Characteristics of Included Studies

The total number of included studies was 27, from which described 31 interventions. Included studies were primarily from the US (n=22) (Anderson and Dusenbury., 1999; Beresford et al., 2001; Beresford et al., 2010; Brehm et al., 2011; Buller et al., 1999; Campbell et al., 2002; Elliot et al., 2004; Emmons et al., 1999; French et al., 2010a; French et al., 2010b; Glasgow et al., 1995; Hebert et al., 1993; Hughes et al., 2011; Siegel et al., 2010; Sorensen et al., 1992; Sorensen et al., 1996; Sorensen et al., 1998; Sorensen et al., 1999; Sorensen et al., 2005; Stamler et al., 1989; Tilley et al., 1999; Wilson et al., 2016).

The remaining studies included three from the Netherlands (Robroek et al., 2012; Van Berkel et al., 2014; Van Wier et al., 2011) and two from Australia (Pritchard et al., 2002; Swinburn et al., 2001).

The majority of studies used the individual as the unit of randomisation, however there were four studies (Beresford et al., 2001; Beresford et al., 2010; Campbell et al., 2002; Hebert et al., 1993) where the unit of randomisation and analysis was the workplace rather than individual workers.

The mean sample size was 885, ranging from 37 (Pritchard et al., 2002) to 3485 (Tilley et al., 1999). Study duration ranged from 12 months (8 studies) to 60 months (1 study) and the median study duration was 24 months. Most studies had a study duration of 24 months (9 studies).

Study populations ranged from low SES (Anderson and Dusenbury., 1999; Beresford et al., 2010; Buller et al., 1999; Campbell et al., 2002; Sorensen et al., 1998; Sorensen et al., 2005) to high SES (Sorensen et al., 1999; Van Wier et al., 2011), with studies that were more ethnically diverse (Sorensen et al., 2005) but the rest were predominantly Caucasian samples.

Some studies targeted specific individuals. Six studies targeted blue collar workers (Anderson and Dusenbury., 1999; Beresford et al 2010; Buller et al.,

1999; Campbell et al., 2002; Sorensen et al., 1998; Sorensen et al., 2005). Some of the occupations targeted included workers from transport (French et al., 2010a; French et al., 2010b) and automotive industries (Tilley et al., 1999), firefighters (Elliot et al., 2004), and service workers (Beresford et al., 2010). One study targeted older workers (aged 40 years or more) (Hughes et al., 2011), one study targeted retired workers (Tilley et al., 1999), one study targeted female workers (Campbell et al., 2002) and two studies included predominantly workers that were well educated (Sorensen et al., 1999; Van Wier et al., 2011). One study targeted workers who were classified as overweight (Van Wier et al., 2011).

Anderson and Dusenbury (1999) specifically targeted smaller workplaces with less than 200 workers, the rest of the studies took place in larger workplaces. The majority of studies (n=26) were conducted in one workplace only (Anderson and Dusenbury., 1999; Beresford et al., 2001; Beresford et al., 2010; Brehm et al., 2011; Buller et al., 1999; Campbell et al., 2002; Elliot et al., 2004; Emmons et al., 1999; French et al., 2010a; French et al., 2010b; Glasgow et al., 1995; Hebert et al., 1993; Hughes et al., 2011; Pritchard et al., 2002; Robroek et al., 2012; Siegel et al., 2010; Sorensen et al., 1992; Sorensen et al., 1998; Sorensen et al., 1999; Sorensen et al., 2005; Stamler et al., 1989; Swinburn et al., 2001; Tilley et al., 1999; Van Berkel et al., 2014; Van Wier et al., 2011; Wilson et al., 2016) however one study was conducted in multiple workplaces (Sorensen et al., 1996) which took place across 108 worksites in the US.

The majority of interventions (n=22) targeted more than one dietary outcome, and of those outcomes, predominantly fruit and/or vegetable (n=24) and/or dietary fat intake (n=25). Other outcomes targeted included intake of fibre, bread, dairy, meats, sweets, dietary cholesterol, sugar sweetened beverages, fast food meals, and urinary sodium output. Therefore, for the purposes of this study, the analysis focussed on fruit and/or vegetable intake, and/or fat intake as the majority of studies targeted either or both of these outcomes.

Risk of Bias Results

The findings from the risk or bias for included studies are summarised in Figure 6 and 7. The risk of bias was unclear for a number of domains across all of the studies, and this was frequently attributed to the lack of reporting in studies. The high number of unclear risk of bias did not necessarily mean those studies were poorer in quality, but was attributed to poor reporting of intervention details. The majority of studies had at least one domain rated as high risk of bias. High risk came predominantly from other biases such as bias relating to trial design, in particular circumstances or settings, followed by incomplete outcome data (attrition bias), blinding of participants (performance bias), blinding of outcome assessment (detection bias), and some selective reporting (reporting bias).

Figure 6: Risk of Bias Summary of the Review Authors' Judgements about each Risk of Bias Item for each Included Study

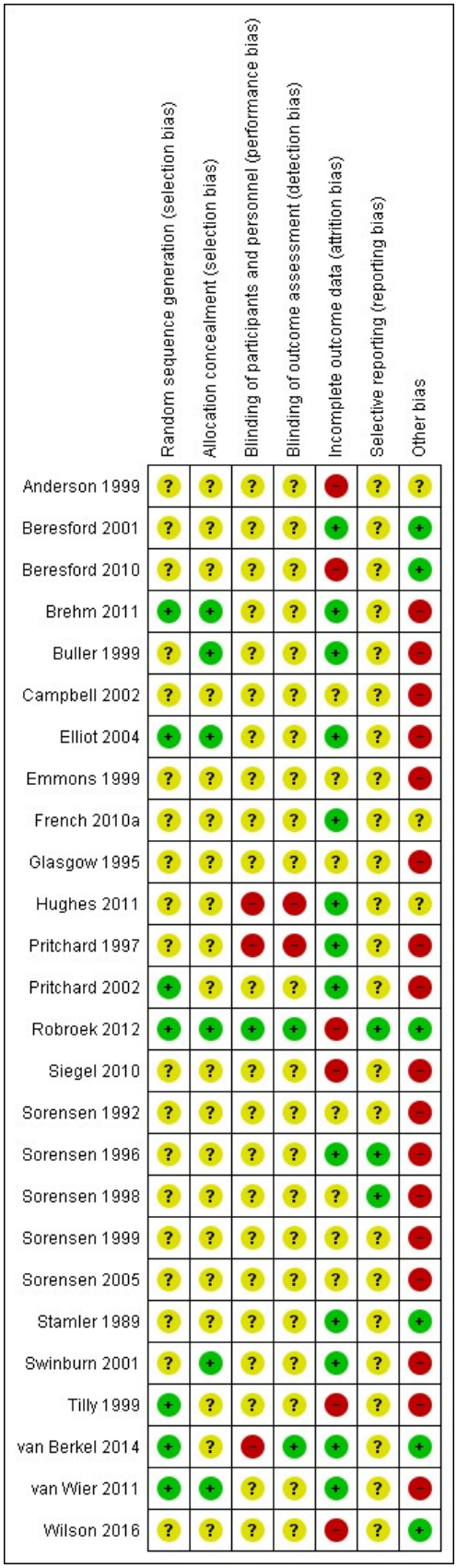
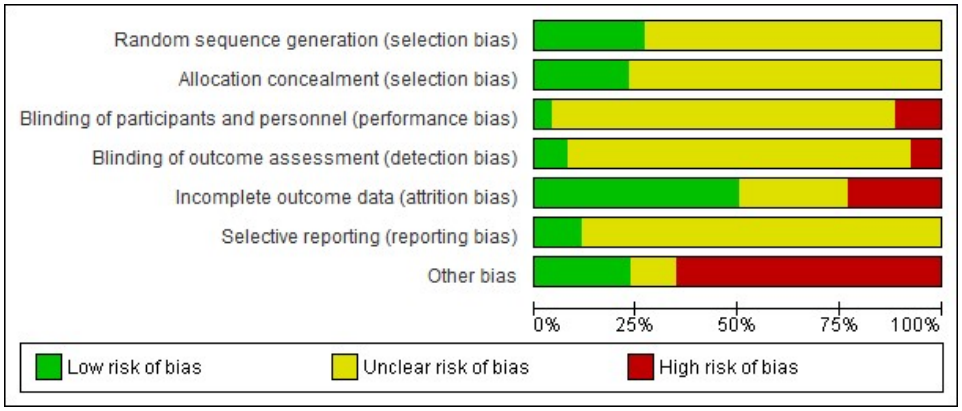


Figure 7: Risk of Bias Graph of the Review Authors' Judgements about each Risk of Bias Item for each Included Study



Summary of Intervention Effects

Table 1 is a summary table of the outcomes from the data extraction of dietary outcomes, the BCTs coded using the CALO-RE taxonomy, and the CAIs coded using Hollands et al, 2017. Summary of intervention effect is highlighted in green for desirable effects, amber for no effect and red for adverse effects.

Interventions that had a desirable outcome (green) are referred to as successful, and interventions that had an undesirable outcome (amber and red) are referred to as unsuccessful. Furthermore, and if there was a desirable effect for 50% or more for outcomes this has been reported.

Of all of the interventions, 17 appeared to be successful and 14 appeared to be unsuccessful (no effect). One study outcome showed an unfavourable increase in fat consumption (Wilson 2016).

Table 3: Summary Tables of Intervention Description and Primary Outcomes

Study details	Intervention summary	Behaviour change techniques (CALO-RE)	Summary of Intervention effect	
Anderson and Dusenbury (1999) Study Design: RCT Country: US Intervention Duration (mo): 12 Final sample size: 122 Targeted small worksites <200 blue collar workers	Intervention 1 (group-based): information provision and self-assessment Intervention 2 (individual self-help): information provision and self-assessment (self-paced delivery) Control: Usual care programme – general health counselling	*Both interventions:* 1 Provide information on consequences of behaviour in general 16 Prompt self-monitoring of behaviour 19 Provide feedback on performance 21 Provide instruction on how to perform the behaviour	Both interventions	
			Fruit & vegetable servings/d	↔
			Fat grams /d	↔
			Fiber grams /d	↔
			Bread servings /d	↔
			Dairy servings /d	↔
			Meats servings /d	↔
			Sweets servings /d	↔
Beresford et al. (2001) Study Design: cRCT Country: US Intervention Duration (mo): 24 Final sample size: 1681	Intervention: Employee advisory board to guide project activities; specified minimum activities required to be delivered; awareness campaigns; information provision; skill building activities; incentives; family involvement. Control: No intervention, data collection only	1 Provide information on consequences of behaviour in general 13 Provide rewards contingent on successful behaviour 16 Prompt self-monitoring of behaviour 19 Provide feedback on performance 21 Provide instruction on how to perform the behaviour 22 Model/demonstrate the behaviour 27 Use of follow-up prompts 29 Plan social support/social change 43 Labelling 46 Availability	Servings of fruit and veg	↑

Beresford et al. (2010) Study Design: cRCT Country: US Intervention Duration (mo):52 Final sample size: 2009 Workplaces consisting of high proportions of blue-collar and service workers	Intervention: Employee advisory board to guide project activities; specified minimum activities required to be delivered; awareness campaigns; information provision; skill building activities; incentives; family involvement. Control: Disease prevention tips	1 Provide information on consequences of behaviour in general 13 Provide rewards contingent on successful behaviour 16 Prompt self-monitoring of behaviour 19 Provide feedback on performance 21 Provide instruction on how to perform the behaviour 22 Model/demonstrate the behaviour 27 Use of follow-up prompts 29 Plan social support/social change 43 Labelling 46 Availability	Servings of fruit and veg	↑
Brehm et al. (2011) Study Design: RCT Country: US Intervention Duration (mo): 12 Final sample size: 266	Intervention: Health fair, employee advisory committee, point-of-decision prompts, cafeteria/vending changes, and educational materials Control: No intervention, data collection only	1 Provide information on consequences of behaviour in general 2 Provide information on consequences of behaviour to individual 13 Provide rewards contingent on successful behaviour 21Provide instruction on how to perform the behaviour 22 Model/demonstrate the behaviour 43 Labelling 45 Sizing 46 Availability 49 Prompting	Intake of saturated fat	↓
			Dietary cholesterol	↓
			Calorie intake	↔
			Macronutrients	↔
Buller et al. (1999) Study Design: RCT Country: US	Intervention: Five a day peer education program – peer educator trained for different employee groups to spend	29 Plan social support/social change 30 Prompt identification as role model/position	Total servings F&V	↑
			Daily servings of fruit	↑

Intervention Duration (mo): 24 Final sample size: 695 Lower SES population	approx. 2 hours discussing eating fruit and vegetables with co-workers – informal conversations, hosting contests and potluck meals, group-discussions and presentations. Peer educators paid $1800 for their time. Control: General 5 a day programme only		Daily servings of veg	↔
			Daily servings of juice	↑
Campbell et al. (2002) Study Design: cRCT Country: US Intervention Duration (mo): 18 Final sample size: 650 Female blue-collar workers	Intervention: Two strategies – 1) individualised computer-tailored health messages; 2) a natural helpers (peer-support) program Control: Delayed intervention condition	1 Provide information on consequences of behaviour in general 5 Goal setting (behaviour) 9 Set graded tasks 19 Provide feedback on performance 21Provide instruction on how to perform the behaviour 22 Model/demonstrate the behaviour 26 Prompt practice 29 Plan social support/social change 30 Prompt identification as role model/position advocate 36 Stress management/emotional training	Total Fruit and Vegetables servings/d	↑
			Fruit servings/d	↑
			Vegetables servings/d	↑
			Fat score g/d	↔

Elliot et al. (2004) Study Design: RCT Country: US Intervention Duration (mo): 12 Final sample size: 480 Firefighters	Intervention 1: Team-centred curriculum – Team sessions with a designated team leader following scripted lesson plans plus activities between sessions. Intervention 2: Individual-centred motivational interviewing – sessions with counsellors trained in MI Control: Received baseline test results only	*Both interventions:* 1 Provide information on consequences of behaviour in general 2 Provide information on consequences of behaviour to individual 5 Goal setting (behaviour) OR 6 Goal setting (outcome) 10 Prompt review of behavioural goals 11 Prompt review of outcome goals 36 Stress management/emotional training Intervention 1 only: 29 Plan social support/social change 30 Prompt identification as role model/position advocate Intervention 2 only: 37Motivational Interviewing	Both interventions	
			Daily servings F+V	↑
			Percent calories from fat	↔
Emmons et al. (1999) Study Design: RCT Country: US Intervention Duration (mo): 30 Final sample size: 2055	Intervention: Participatory intervention approach. Employee advisory boards formed to plan and tailor intervention activities. Interventions aimed at individual and environmental levels of change. Control: Standard care condition (self-help programmes)	1 Provide information on consequences of behaviour in general 13 Provide rewards contingent on successful behaviour 17 Prompt self-monitoring of behavioural outcome 19 Provide feedback on performance 20Provide information on where and when to perform behaviour 21Provide instruction on how to perform the behaviour 22 Model/demonstrate the behaviour	Servings of F+V	↑
			% calories/fat	↔

		42 Functional Design 43 Labelling 46 Availability 47 Proximity	Fiber g	↑
French et al. (2010a and b) Study Design: RCT Country: US Intervention Duration (mo): 18 Final sample size: 103 Transport workers	Intervention: Garage advisory groups (worked with researchers to discuss intervention and measurement activities); Vending machines – increased availability and lowered price of healthful choices; behavioural food and physical activity programs; 1 day health and fitness expo; farmer's markets; and new driver peer mentoring program Control: No intervention, data collection only	13 Provide rewards contingent on successful behaviour 21Provide instruction on how to perform the behaviour 22 Model/demonstrate the behaviour 29 Plan social support/social change 43 Labelling 46 Availability	Fruit and vegetables servings /d	↑
			Sugar beverages serving /d	↔
			snacks/sweets servings/d	↔
			fast food meals /week	↔
			kcals/d	↓
Glasgow et al. (1995) Study Design: RCT Country: US Intervention Duration (mo): 24 Final sample size: 1222	Intervention: Employee steering committee adapted and implemented intervention activities – education/skills training; incentives; policy/environmental changes; working with local	1 Provide information on consequences of behaviour in general 2 Provide information on consequences of behaviour to individual 13 Provide rewards contingent on successful behaviour 19 Provide feedback on performance	Fat intake (g)	↔

	health agencies and participating in community events Control: Delayed intervention	21 Provide instruction on how to perform the behaviour 22 Model/demonstrate the behaviour 43 Labelling 46 Availability 49 Prompting	Calories from fat %	↔
Hughes et al. (2011) Study Design: RCT Country: US Intervention Duration (mo):12 Final sample size: 225 Older employees (40 years or older)	Intervention 1 (COACH): Individualised counselling with coach trained in behaviour change techniques – conducted risk assessment and negotiated action plans (that were revised and expanded throughout the intervention). Intervention 2 (RealAge): Web-based intervention with standardised risk assessment and action plans Control: Printed health promotion materials	*Both interventions:* 2 Provide information on consequences of behaviour to individual 5 Goal setting (behaviour) OR 6 Goal setting (outcome) 10 Prompt review of behavioural goals 11 Prompt review of outcome goals 27 Use of follow-up prompts	COACH	
			% energy from fat	↓
			F+V consumption	↑
			RealAge	
			% energy from fat	↔
			F+V consumption	↔
Pritchard et al. (2002) Study Design: RCT Country: Australia Intervention Duration (mo): 12 Final sample size: 37	Intervention: Ad-libitum low-fat diet (22%-25% of energy from fat). Participants provided with guidance and a personalised diet plan, and supported with counselling sessions.	1 Provide information on consequences of behaviour in general 2 Provide information on consequences of behaviour to individual 19 Provide feedback on performance	Energy intake	↓

	Control: Delayed intervention control. Instructed to keep diet and exercise as normal. Conducted data collection assessments only.		% energy as fat	↓
Robroek et al. (2012) Study Design: RCT Country: Netherlands Intervention Duration (mo): 24 Final sample size: 558	Intervention: Enhanced internet-delivered workplace health promotion programme including tailored advice, online self-monitoring Control: General internet-delivered workplace health promotion – website containing general information concerning lifestyle and health and personal reports based on baseline data	1 Provide information on consequences of behaviour in general 2 Provide information on consequences of behaviour to individual 19 Provide feedback on performance 10 Prompt review of behavioural goals 11 Prompt review of outcome goals 27 Use of follow-up prompts	Sufficient fruit intake	↔
			Sufficient vegetable intake	↑
Siegel et al. (2010) Study Design: RCT Country: US Intervention Duration (mo): 24 Final sample size: 125	Intervention: Participatory approach – wellness committee formed to implement health promotion activities. Stipend of $3500 per year provided. Interschool competitions and prizes for attendance at wellness activities Control: $1000 stipend at baseline and follow up	36 Stress management/emotional control training 13 Provide rewards contingent on successful behaviour 21Provide instruction on how to perform the behaviour 22 Model/demonstrate the behaviour 27 Use of follow-up prompts 46 Availability	Daily fruit servings, cups	↔
			Daily vegetable servings cups	↔

Sorensen et al. (1992) and Hebert et al. (1993) Study Design: RCT Country: US Intervention Duration (mo): 15 Final sample size: 2011 and 1762	Intervention: classes and food demonstrations, cafeteria point-of-choice labelling; employee advisory board Control: No intervention, data collection only	21 Provide instruction on how to perform the behaviour 22 Model/demonstrate the behaviour 43 Labelling (point of choice)	Total fat % calories	↔
			Total fiber (In)	↔
			Total SFA grams /d	↔
			Total SFA % total energy	↔
Sorensen et al. (1996) Study Design: RCT Country: US Intervention Duration (mo): 24 Final sample size:?? (108 worksites)	Intervention: Participatory approach; kickoff event; interactive activities; posters and brochures; campaigns and contests; direct education; environmental changes – changes in food offerings and/or nutrition education in cafeterias and vending machines, and catering policies. Control: Minimal intervention – distribution of printed materials such as posters and newsletters	1 Provide information on consequences of behaviour in general 2 Provide information on consequences of behaviour to individual 19 Provide feedback on the performance 46 Availability 49 Prompting	% energy as fat	↓
			grams of Fibre per 1000kcal	↔
			Servings of F+V	↑
Sorensen et al. (1998) Study Design: RCT Country: US	Intervention: Three key elements 1) joint worker-management participation in program planning and implementation (employee	1 Provide information on consequences of behaviour in general 19 Provide feedback on performance 21 Provide instruction on how to perform the behaviour	% energy as fat	↓

Intervention Duration (mo): 24 Final sample size: 2386 Targeted at blue-collar workers	advisory board); 2) worksite environmental changes including the availability of health foods; 3) health education programmes targeting individual behaviours Control: No intervention, data collection only	22 Model/demonstrate the behaviour 46 Availability	grams of Fibre per 1000kcal	↔
			Servings of F+V	↔
Sorensen et al. (1999) Study Design: RCT Country: US Intervention Duration (mo): 15 Final sample size: 1294	Intervention 1: Minimal intervention plus worker participation in program planning and implementation (employee advisory board), programmes aimed at individual behaviour change, and changes in worksite environment (increase	*Both interventions:* 1 Provide information on consequences of behaviour in general 2 Provide information on consequences of behaviour to individual 21Provide instruction on how to perform the behaviour 22 Model/demonstrate the behaviour	Servings fruits & vegetables	Worksite-plus-family intervention ↑

Participants generally well-educated	availability of fruits and vegetables). Intervention 2: As Intervention 1 plus family-focused interventions including information provision to families and annual family festival. Control: Minimal intervention - Periodic exposure to the national 5-a-Day media campaign, promotion of the Cancer information Service Hotline, and general nutrition presentation and taste test	13 Provide rewards contingent on successful behaviour 27 Use of follow-up prompts 43 Labelling 46 Availability 49 Prompting	Servings fruits & vegetables	Worksite intervention ↔
Sorensen et al. (2005) Study Design: RCT Country: US Intervention Duration (mo): 48 Final sample size: 974 Working class, multi-ethnic workers	Intervention: Joint worker-manager participation in program planning and implementation (employee advisory boards); individual/interpersonal interventions – demonstrations, small-group discussions, health fairs, educational materials for families; environmental/organisational changes including offering healthful food at meetings and events.	1 Provide information on consequences of behaviour in general 2 Provide information on consequences of behaviour to individual 21Provide instruction on how to perform the behaviour 22 Model/demonstrate the behaviour 19 Provide feedback on performance 29 Plan social support/social change 46 Availability	≥ 5 servings of F+V/d	↔
			≤ 3 servings of red meat/wk	↔
			≥ 5 servings of F+V/d Managers	↔

	Control: Minimal intervention – smoking cessation program		≥ 5 servings of F+V/d Workers	↔
Stamler et al. (1989) Study Design: RCT Country: US Intervention Duration (mo): 60 Final sample size: 172	Intervention: Individualised approach with physician and nutrition counsellors. Individualised diet suggestions; information provision on healthy eating; inclusion of family members; some group counselling Control: monitoring only	1 Provide information on consequences of behaviour in general 2 Provide information on consequences of behaviour to individual 5 Goal setting (behaviour) 6 Goal setting (outcome) 29 Plan social support/social change 21 Provide instruction on how to perform the behaviour 27 Use of follow-up prompts	Urinary sodium output mg/d	↓
			Daily energy intake	↓
			% energy as fat	↓
Swinburn et al. (2001) Study Design: RCT Country: Australia Intervention Duration (mo): 12 Final sample size: 136	Intervention: Reduced fat diet – small group session s comprises education, personal goal setting, and self-monitoring Control: General dietary advice about healthy food choices at baseline	1 Provide information on consequences of behaviour in general 5 Goal setting (behaviour) 10 Prompt review of behavioural goals 16 Prompt self-monitoring of behaviour 20 Provide information on where and when to perform the behaviour 21 Provide instruction on how to perform the behaviour	Energy kcal	↓
			Fat g	↓
			Fat % energy	↓
			CHO g	↔
			CHO % energy	↑
			Protein g	↔
			Protein % energy	↑
			Fiber g	↔
			Fiber g/1000kcal	↔
Tilley et al. (1999) Study Design: RCT Country: US and Canada Intervention Duration (mo): 24 Final sample size: 3485	Intervention: First 12 months – 5 nutrition classes and mailed self-help materials; second 12 months – worksite posters and personalised feedback from dietary assessment Throughout intervention – quarterly newsletters	5 Goal setting (behaviour) 6 Goal setting (outcome) 21 Provide instruction on how to perform the behaviour 22 Model/demonstrate the behaviour 19 Provide feedback on performance 27 Use of follow-up prompts (newsletter?) 29 Plan social support/social change 41 Ambience	Fat %energy	↔
			Fibre g/1000kcal	↑
			Fruit servings /d	↔
			Vegetables servings /d	↔

Automotive industry employees, retired employees	Control: Data collection only	49 Prompting	F+V servings /d	↔
van Berkel et al. (2014) Study Design: RCT Country: Netherlands Intervention Duration (mo): 12 Final sample size: 233	Intervention: Mindfulness-based programme – 8 sessions with trainer; 8 sessions e-coaching. Free fruit and snack vegetables provided. Buddy system. Control: Data collection only	1 Provide information on consequences of behaviour in general 2 Provide information on consequences of behaviour to individual 29 Plan social support/social change 36 Stress management/emotional control training 46 Availability	Fruit intake servings /d	↔
van Wier et al. (2011) Study Design: RCT Country: Netherlands Intervention Duration (mo):24 Final sample size: 792 Overweight employees Highly educated?	Intervention 1 (internet): Self-help brochure about overweight, healthy diet and physical activity; interactive website with personalised web pages and modules to promote behaviour change strategies; contact with personal counsellor Intervention 2 (phone): Self-help brochure about overweight, healthy diet and physical activity; workbook with modules to promote behaviour change strategies; contact with personal counsellor Control: Self-help brochure about overweight, healthy diet and physical activity	*Both interventions:* 5 Goal setting (behaviour) 6 Goal setting (outcome) 10 Prompt review of behavioural goals 11 Prompt review of outcome goals	Both interventions	
			Fat consumption score/day	↔
			Vegetable consumption g/d	↔
			Fruit consumption pieces/d	↔

Wilson et al. (2016) Study Design: RCT Country: USA Intervention Duration (mo):12 Final sample size: 418	Intervention 1 (phone): one-on-one phone calls with health coach to develop action plans. Intervention 2 (small group): small group sessions where action plans were developed. Group members provided support for each other. Intervention 3 (self-study; active control): Programme manual with information on programme goals. Email reminders to review each lesson.	*Both interventions:* 1 Provide information on consequences of behaviour in general 2 Provide information on consequences of behaviour to individual 5 Goal setting (behaviour) 6 Goal setting (outcome) 10 Prompt review of behavioural goals 11 Prompt review of outcome goals 19 Provide feedback on performance 27 Use of follow-up prompts *Intervention 2 only:* 28 Facilitate social comparison 29 Plan social support/social change	Intervention 1	
			% calories from fat	↑
			Intervention 2	
			% calories from fat	↔

2.3.2 All Interventions

The majority of interventions targeted more than one dietary outcome, and of those outcomes, predominantly fruit and/or vegetable (n=24) and/or dietary fat intake (n=25). This prompted the analysis to focus on fruit and/or vegetable intake, and fat intake as most studies targeted either or both of these outcomes.

2.3.3 Interventions Targeting Fruit and Vegetable Intake

Of all the included interventions, 24 interventions reported results on fruit and/or vegetable intake, of which 12 reported a significant increase in consumption (Beresford et al., 2001; Beresford et al., 2010; Buller et al., 1999; Campbell et al., 2002; Elliot et al., 2004 (both interventions); Emmons et al., 1999; French et al., 2010a; French et al., 2010b; Hughes et al., 2011 (intervention 1); Robroek et al., 2012; Sorensen et al., 1999 (intervention 1); Sorensen et al., 1996).

A total of 10 interventions reported no change in fruit and/or vegetable consumption (Anderson and Dusenbury., 1999 (both interventions); Hughes et al., 2011 (intervention 2); Siegel et al., 2010; Sorensen et al., 1999 (intervention 2); Sorensen et al., 2002; Sorensen et al., 2005; van Berkel et al., 2014; van Wier et al., 2011 (both interventions)).

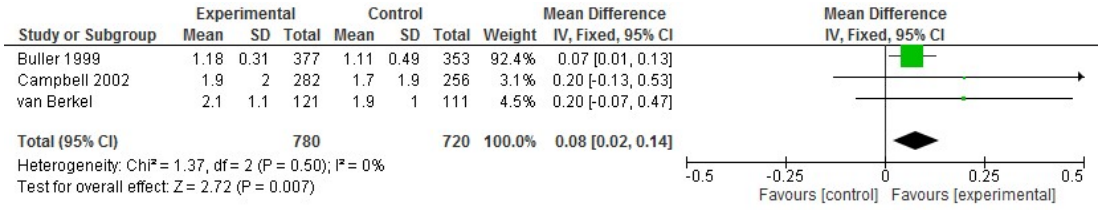
A total of two interventions reported a significant increase in fruit and/or vegetable intake as a result of one arm of the intervention (Hughes et al., 2011 (intervention 1); and Sorensen et al., 1999 (intervention 1)) with the other arm of the intervention showing no significant change in intake.

There were two interventions that targeted fruit intake only, of which one reported significant an increase in consumption (Buller et al., 1999) and one study that showed no change in consumption (van Berkel et al., 2014). There was one intervention that targeted vegetable intake only and showed a significant increase in consumption (Robroek et al., 2012).

2.3.3.1 Meta-analysis Subgroup Fruit and/or Vegetable Intake

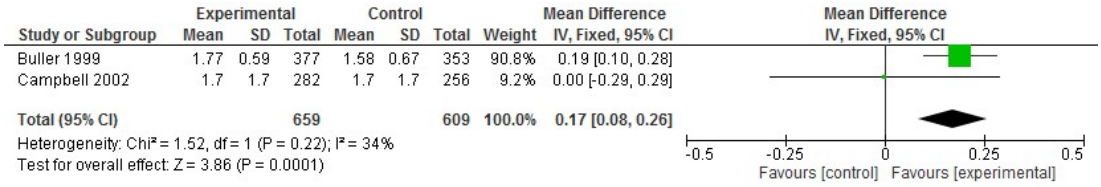
Three studies were eligible for meta-analysis for fruit intake (Buller et al., 1999; Campbell et al., 2002; van Berkel et al., 2014). All three interventions fall to the right and the overall intervention effect favours the experimental condition. The average increase in fruit intake was 0.08g per day.

Figure 8: Forest Plot of Fruit Intake



A total of two studies were eligible for inclusion in meta-analysis for vegetable intake (Buller et al., 1999; Campbell et al., 2002). The overall intervention effect favours the experimental condition. The average increase in vegetable intake was 0.17g per day.

Figure 9: Forest Plot of Vegetable Intake



2.3.4 Interventions Targeting Fat Intake

Of all the included interventions, 25 interventions reported results on dietary fat intake of which five studies reported significant decrease in fat consumption (Brehm et al., 2011; Hughes et al., 2011 (intervention 1); Pritchard et al., 2002; Sorensen et al., 1996; Swinburn et al., 2001))

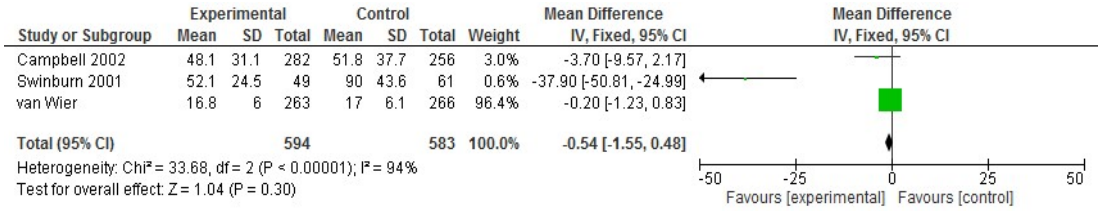
A total of eight interventions reported no change in fat consumption (Anderson and Dusenbury., 1999 (both interventions); Glasgow et al., 1995; Hughes et al., 2011 (intervention 2); Sorensen et al., 1992; van Wier et al., 2011 (both interventions); Wilson et al., 2016 (intervention 1)).

One intervention reported a significant increase in fat intake as a result of one arm of the intervention (Wilson et al., 2016 (intervention 1)) with the other arm of the intervention showing no significant change in intake.

2.3.4.1 Meta-analysis Subgroup Fat Intake

There were three studies eligible for inclusion in the meta-analysis for Total Fat intake (Campbell et al., 2002; Swinburn et al., 2001; van Wier et al., 2011). No significant overall effect.

Figure 10: Forest Plot of Fat Intake



2.5 Interventions Targeting Other Dietary Outcomes

2.5.1 Fibre Intake

Three studies reported results of fibre intake, two of which reported a significant increase in fibre intake as a result of the intervention (Emmons et al., 1999; Tilley et al., 1999), and one reported no significant change in intake.

2.5.2 Bread and Dairy Intake

Bread and dairy intake were reported by one paper, (Anderson and Dusenbury., 1999) the outcome of which was no significant change in intake post-interventions.

2.5.3 Meat Intake

Meat intake was reported by two papers (Anderson and Dusenbury., 1999; Sorensen et al., 2005). Both studies reported no significant changes in intake post-interventions.

2.5.4 Snacks/Sweets Intake

Three papers (Anderson and Dusenbury., 1999; French et al., 2010a: French et al., 2010b) reported no significant changes in sweet and sweet snack intake post intervention.

2.5.5 Sugar Sweetened Beverage Intake

Two papers reported no significant changes in intake of sugar sweetened beverages as a result of the interventions.

2.5.6 Energy Intake

Six studies reported energy intake as an outcome measure. Four studies reported a significant decrease in energy intake. One study reported no significant change in energy intake.

2.5.7 Carbohydrate and Protein Intake

A study by Swinburn et al (2001) reported no significant change in intake of Carbohydrate and Protein intake post-intervention, and a significant increase in percentage energy derived from carbohydrate and protein.

2.5.8 Dietary Cholesterol

Two studies reported dietary cholesterol as an outcome. One study reported a significant increase in dietary cholesterol, the other a significant decrease

in dietary cholesterol post-intervention. One study (Glasgow et al., 1995) reported no significant changes in serum cholesterol level (as reported above).

2.5.9 Urinary Sodium Output

One study by Stamler et al (1989) reported a significant increase in urinary sodium output (mg/day) post-intervention

2.5.10 Fast Food Meals

One study (French et al., 2010a) reported no significant changes in consumption of fast food meals per week, or vending machine use post-intervention.

2.4 Interventions Targeting Costs, Absences and Productivity Outcomes

One study (Robroek et al., 2012) reported absence and productivity rates outcomes and estimates of costs to employers in terms of reducing absence rates and increasing productivity. No significant change was reported for any of these outcomes.

2.5 Results by Intervention Characteristics

2.5.1 Behaviour Change Techniques (BCTs)

Table 4 shows details of the mean number of BCTs and CAIs used within the dietary workplace interventions. Successful interventions used slightly more behaviour change techniques and choice architecture interventions compared with interventions that were unsuccessful.

Table 5 summarises the frequency and success rates of all interventions (n=31) using each CALO-RE BCT. The top five most popular BCTs used of all interventions were Provide information on consequences of behaviour in general (used in 21 interventions (68%)), Provide information on

consequences of behaviour to individual (used in 16 interventions (52%)), Provide instruction on how to perform the behaviour (used in 16 interventions (52%)), Provide feedback on performance (used in 14 interventions (45%)) and Model/demonstrate the behaviour (used in 14 interventions (45%)).

Table 4: Mean (SD) Number of Behaviour Change Techniques and Choice Architecture Interventions Used Within the Dietary Workplace Interventions

	All interventions (n=31)	Successful interventions (n=17)	Unsuccessful interventions (n=14)
Behaviour Change Techniques	5.8 (2.1)	6.2 (2.2)	5.3 (2.0)
Choice Architecture Interventions	1.0 (1.3)	1.2 (1.5)	0.9 (1.1)

Of these the most successful interventions in terms of improving outcomes was Provide instruction on how to perform the behaviour (69%), Provide information on consequences of behaviour in general (67% successful) Interventions with a high percentage (100%) of success in improving ≥1 outcome used the BCTs Prompt identification as role model/position advocate, Provide information on where and when to perform behaviour, set guided tasks, Prompt self-monitoring of behavioural outcome, Prompt practice, Motivational Interviewing. However, there were few (≤3) interventions that used these techniques.

Interestingly, there were some BCTs used in a reasonable number of interventions for comparison that were 73-75% successful, these include Plan social support/social change (used in 11 interventions, of which 73% were successful), Provide rewards contingent on successful behaviour (used in 8 interventions, of which 75% were successful).

Table 5: Frequency and Success Rate of all Interventions Using CALO-RE

Behaviour change technique (BCT)	Total interventions using BCT n (%)		% interventions successful (≥1 outcome improved)	% interventions successful (≥50% outcomes improved)
1 Provide information on consequences of behaviour in general	21	(68)	67	62
2 Provide information on consequences of behaviour to individual	16	(52)	56	56
21 Provide instruction on how to perform the behaviour	16	(52)	69	50
19 Provide feedback on performance	14	(45)	64	50
22 Model/demonstrate the behaviour	14	(45)	64	43
27 Use of follow-up prompts	12	(39)	58	50
5 Goal setting (behaviour)	11	(35)	64	55
29 Plan social support/social change	11	(35)	73	55
10 Prompt review of behavioural goals	10	(32)	50	50
6 Goal setting (outcome)	9	(29)	56	44
11 Prompt review of outcome goals	9	(29)	44	44
13 Provide rewards contingent on successful behaviour	8	(26)	75	63
36 Stress management/emotional training	5	(16)	60	60
16 Prompt self-monitoring of behaviour	4	(13)	75	75
30 Prompt identification as role model/position advocate	3	(10)	100	100
20 Provide information on where and when to perform behaviour	2	(6)	100	100
9 Set graded tasks	1	(3)	100	100
17 Prompt self-monitoring of behavioural outcome	1	(3)	100	100
26 Prompt practice	1	(3)	100	100
28 Facilitate social comparison	1	(3)	0	0
37 Motivational Interviewing	1	(3)	100	100
3 Provide information about others' approval	0	(0)	-	-

4 Provide normative information about others' behaviour	0	(0)	-	-
7 Action planning	0	(0)	-	-
8 Barrier identification/problem solving	0	(0)	-	-
12 Prompt rewards contingent on effort or progress towards behaviour	0	(0)	-	-
14 Shaping	0	(0)	-	-
15 Prompting generalisation of a target behaviour	0	(0)	-	-
18 Prompting focus on past success	0	(0)	-	-
23 Teach to use prompts/cues	0	(0)	-	-
25 Agree behavioural contract	0	(0)	-	-
31 Prompt anticipated regret	0	(0)	-	-
32 Fear arousal	0	(0)	-	-
33 Prompt self-talk	0	(0)	-	-
34 Prompt use of imagery	0	(0)	-	-
35 Relapse prevention/coping planning	0	(0)	-	-
38 Time management	0	(0)	-	-
39 General communication skills training	0	(0)	-	-
40 Stimulate anticipation of future rewards	0	(0)	-	-

2.5.1.1 Fruit and Vegetable Intake

Table 6 summarises the frequency and success rates of interventions targeting fruit and vegetable intake (n=24) using each CALO-RE BCT. The top three most popular BCTs used of all interventions were Provide information on consequences of behaviour in general (used in 16 interventions (67%)), Provide instruction on how to perform the behaviour (used in 14 interventions (58%)), Provide feedback on performance (used in 12 interventions (50%)), and Model/demonstrate the behaviour (used in 12 interventions, (50%)).

Of these the most successful interventions in terms of improving fruit and/or vegetable intake was Provide information on consequences of behaviour in general with a 63% success rate.

Interventions with a high percentage (100%) of success in improving fruit and/or vegetable intake used the BCTs Set graded tasks, Prompt practice, Motivational interviewing, Prompt self-monitoring of behavioural outcome, and Provide information on where and when to perform the behaviour. However, there were few (≤2) interventions that used these techniques.

The BCT Prompt identification as role model/position advocate is of interest, used in 5 interventions with 100% success in improving fruit and/or vegetable intake. Interestingly, there were some BCTs used in a good number of interventions that were 70-73% successful, these include Plan social support/social change (used in 11 interventions, of which 73% were successful), Provide information on consequences of behaviour to individual (used in 10 interventions, of which 70% were successful), and Prompt review of behavioural goals, Prompt review of outcome goals, Provide rewards contingent on successful behaviour (all three BCTs used in seven interventions, of which 71% were successful).

Table 6: Frequency and Success Rates of Interventions Targeting Fruit and Vegetable Intake Using CALO-RE

Behaviour change technique (BCT)	Total interventions using BCT n (%)		% interventions successful
1 Provide information on consequences of behaviour in general	16	(67)	63
21 Provide instruction on how to perform the behaviour	14	(58)	50
19 Provide feedback on performance	12	(50)	58
22 Model/demonstrate the behaviour	12	(50)	58
29 Plan social support/social change	11	(46)	73
2 Provide information on consequences of behaviour to individual	10	(42)	70
27 Use of follow-up prompts	10	(42)	60
5 Goal setting (behaviour)	9	(38)	67
6 Goal setting (outcome)	7	(29)	57
10 Prompt review of behavioural goals	7	(29)	71
11 Prompt review of outcome goals	7	(29)	71
13 Provide rewards contingent on successful behaviour	7	(29)	71
36 Stress management/emotional training	6	(25)	67
30 Prompt identification as role model/position advocate	5	(21)	100
16 Prompt self-monitoring of behaviour	4	(17)	50
9 Set graded tasks	2	(8)	100
26 Prompt Practice	2	(8)	100
37 Motivational Interviewing	2	(8)	100
17 Prompt self-monitoring of behavioural outcome	1	(4)	100
20 Provide information on where and when to perform behaviour	1	(4)	100
3 Provide information about others' approval	0	(0)	-
4 Provide normative information about others' behaviour	0	(0)	-

7 Action planning	0	(0)	-
8 Barrier identification/problem solving	0	(0)	-
12 Prompt rewards contingent on effort or progress towards behaviour	0	(0)	-
14 Shaping	0	(0)	-
15 Prompting generalisation of a target behaviour	0	(0)	-
18 Prompting focus on past success	0	(0)	-
23 Model/Demonstrate the behaviour	0	(0)	-
25 Agree behavioural contract	0	(0)	-
28 Facilitate social comparison	0	(0)	-
31 Prompt anticipated regret	0	(0)	-
32 Fear arousal	0	(0)	-
33 Prompt self-talk	0	(0)	-
34 Prompt use of imagery	0	(0)	-
35 Relapse prevention/coping planning	0	(0)	-
38 Time management	0	(0)	-
39 General communication skills training	0	(0)	-
40 Stimulate anticipation of future rewards	0	(0)	-

2.5.1.2 Dietary Fat Intake

Table 7 summarises the frequency and success rates of interventions targeting dietary fat intake (n=25) using each CALO-RE BCT. The top three most popular BCTs used of all interventions were Provide information on consequences of behaviour in general (used in 15 interventions (60%)), with three BCTs Provide information on consequences of behaviour to individual, Goal setting, Provide feedback on performance (all three used in 11 interventions (44%)), and Provide instruction on how to perform the behaviour (used in 10 interventions, (40%)).

Of these the most successful interventions in terms of dietary fat intake was Provide information on consequences of behaviour to individual with a 45% success rate (versus 40%, 40%, 27%, 27%). This is low however.

No BCTs had a 100% success rate. The highest success rate was 50% for the BCT Provide information on where and when to perform behaviour but was based on only two interventions. The next best success rates were for the BCTs Provide information on consequences of behaviour to individual (used in 11 intervention with a 45% success rate), Provide information on consequences of behaviour in general (used in 15 interventions with a 40% success rate) and Provide instruction on how to perform the behaviour (used in 10 interventions with a 40% success rate)

Table 7: Frequency and Success Rates of Interventions Targeting Dietary Fat Intake Using CALO-RE

Behaviour change technique (BCT)	Total interventions using BCT n (%)		% interventions successful
1 Provide information on consequences of behaviour in general	15	(60)	40
2 Provide information on consequences of behaviour to individual	11	(44)	45
5 Goal setting (behaviour)	11	(44)	27
19 Provide feedback on performance	11	(44)	27
21 Provide instruction on how to perform the behaviour	10	(40)	40
6 Goal setting (outcome)	9	(36)	22
10 Prompt review of behavioural goals	8	(32)	25
11 Prompt review of outcome goals	7	(28)	14
22 Model/demonstrate the behaviour	6	(24)	33
27 Use of follow-up prompts	6	(24)	33
29 Plan social support/social change	4	(16)	25
13 Provide rewards contingent on successful behaviour	3	(12)	33
16 Prompt self-monitoring of behaviour	3	(12)	33
20 Provide information on where and when to perform behaviour	2	(8)	50
36 Stress management/emotional training	2	(8)	0
9 Set graded tasks	1	(4)	0
17 Prompt self-monitoring of behavioural outcome	1	(4)	0
28 Facilitate social comparison	1	(4)	0
30 Prompt identification as role model/position advocate	1	(4)	0
37 Motivational Interviewing	1	(4)	0
3 Provide information about others' approval	0	(0)	-

4 Provide normative information about others' behaviour	0	(0)	-
7 Action planning	0	(0)	-
8 Barrier identification/problem solving	0	(0)	-
12 Prompt rewards contingent on effort or progress towards behaviour	0	(0)	-
14 Shaping	0	(0)	-
15 Prompting generalisation of a target behaviour	0	(0)	-
18 Prompting focus on past success	0	(0)	-
23 Teach to use prompts/cues	0	(0)	-
25 Agree behavioural contract	0	(0)	-
26 Prompt practice	0	(0)	-
31 Prompt anticipated regret	0	(0)	-
32 Fear arousal	0	(0)	-
33 Prompt self-talk	0	(0)	-
34 Prompt use of imagery	0	(0)	-
35 Relapse prevention/coping planning	0	(0)	-
38 Time management	0	(0)	-
39 General communication skills training	0	(0)	-
40 Stimulate anticipation of future rewards	0	(0)	-

2.5.2 Choice Architecture Interventions (CAIs)

Table 8 summarises the frequency and success rates of all interventions (n=31) using each CAI in Micro-environments. The three most popular CAIs used of all in interventions were Availability (13 interventions (42%)), Labelling (eight interventions (26%)) and prompting (five interventions (16%)). The rest of the CAIs (ambience, functional design, sizing, proximity) were only used in one intervention each and although these CAIs show 100% success in improving outcomes, because there were so few interventions this result should be treated with caution.

Availability was the most commonly used CAI (13 interventions (42%)) however the success rate was 62% in improving ≥1 outcome and 46% success in improving ≥50% of outcomes. In contrast, Prompting was used in five interventions and had a success rate of 80% and 60% in improving ≥1 and ≥50% of outcomes respectively; and labelling was used in eight interventions with 75% and 63% success in improving ≥1 and ≥50% of outcomes respectively.

Table 8: Frequency and Success Rates of All Interventions Using TIPPME

Choice Architecture Intervention (CAI)	Total interventions using BCT n (%)		% interventions successful (≥1 outcome improved)	% interventions successful (≥50% outcomes improved)
46 Availability	13	(42)	62	46
43 Labelling	8	(26)	75	63
49 Prompting	5	(16)	80	60
41 Ambience	1	(3)	100	0
42 Functional Design	1	(3)	100	100
45 Sizing	1	(3)	100	100
47 Proximity	1	(3)	100	100

2.5.2.1 Fruit and Vegetable Intake

Table 9 summarises the frequency and success rates of interventions targeting fruit and vegetable intake (n=24) using each CAI in micro-environments. The three most popular CAIs used of all in interventions were Availability (11 interventions (46%)), Labelling (5 interventions (21%)) and prompting (3 interventions (13%)). The rest of the CAIs (ambience, functional design, and proximity) were only used in ≤2 interventions. Despite the CAI Functional Design showing 100% success in improving fruit and/or vegetable intake, because there were so few interventions this is not reliable.

Availability was the most commonly used CAI (11 interventions (46%)) however the success rate was 55% in improving fruit and/or vegetable intake. In contrast, Labelling was used in five interventions with 80% success in improving fruit and/or vegetable intake; and Prompting was used in three interventions and had a success rate of 67% in improving fruit and/or vegetable intake.

There were 20 BCTs and three CAIs not used at all in any of the interventions. There is a requirement for more research into the less popular techniques to identify why they were unpopular.

Table 9: Frequency and Success Rates of Interventions Targeting Fruit and Vegetable Intake Using TIPPME

Choice Architecture Intervention (CAI)	Total interventions using CAI n (%)		% interventions successful
46 Availability	11	(46)	55
43 Labelling	5	(21)	80
49 Prompting	3	(13)	67
42 Functional Design	2	(8)	100
47 Proximity	2	(8)	50
41 Ambience	1	(4)	0
44 Presentation	0	(0)	0
45 Sizing	0	(0)	0
48 Priming	0	(0)	0

2.5.2.2 Dietary Fat Intake

Table 10 summarises the frequency and success rates of interventions targeting dietary fat intake (n=25) using each CAI in micro-environments. The three most popular CAIs used of all in interventions were Availability (5 interventions (20%)), Labelling (four interventions (16%)) and prompting (four interventions (16%)). The rest of the CAIs (ambience, functional design, sizing, proximity) were only used in one intervention. Despite the CAI Sizing showing 100% success in reducing dietary fat intake, because there were so few interventions this is not reliable.

Availability was the most commonly used CAI (five interventions (20%)) and had the highest success rate of 60% in reducing dietary fat intake. Prompting and Labelling were both used in four interventions but Prompting had a higher success rate of 50% in reducing dietary fat intake compared to Labelling with 25% success.

There were 20 BCTs and two CAIs not used at all in any of the interventions. There is a requirement for more research into the less popular techniques to identify why they were unpopular.

Table 10: Frequency and Success Rates of Interventions Targeting Dietary Fat Intake Using TIPPME

Choice Architecture Intervention (CAI)	Total interventions using CAI n (%)		% interventions successful
46 Availability	5	(20)	60
43 Labelling	4	(16)	25
49 Prompting	4	(16)	50
41 Ambience	1	(4)	0
42 Functional Design	1	(4)	0
45 Sizing	1	(4)	100
47 Proximity	1	(4)	0
44 Presentation	0	(0)	0
48 Priming	0	(0)	0

2.6 Interventions with Participatory and Peer-Support Components

Another distinct characteristic of the included interventions identified through the data synthesis was participatory and peer-support approaches. A total of 12 interventions followed a participatory approach whereby employees were involved in the design and delivery of intervention activities (usually through an Employee Advisory Board). Of these interventions seven (58%) showed favourable outcomes in terms of increased fruit and vegetable, and fibre intakes, and reduced fat and energy intakes.

Peer support components (such as a buddy system) were used in four interventions, with two of these showing favourable outcomes (increases in fruit and vegetable consumption) but the other two resulting in no dietary changes. The remaining 15 interventions used neither approaches and of these eight (53%) lead to favourable changes to dietary intake (including increased fruit and vegetable, and fibre intake, and reduced fat, energy and sodium intakes).

One study investigated two interventions, one using group member support, and the other without (Wilson et al., 2016). The intervention without group member support lead to the adverse effect of increased fat intake. On the other hand, the intervention with group member support, although did not lead to favourable changes in fat intake, no adverse effects occurred.

2.7 Effects on Health Inequalities

Five studies investigated the effects of interventions targeting blue collar workers only (Anderson and Dusenbury., 1999; Beresford et al., 2010; Buller et al., 1999; Campbell et al., 2002; Sorensen et al., 1998). Interventions delivered to groups of low socio-economic status can be considered as using a ‘targeted’ approach to reducing health inequalities. By improving the health of low socio-economic groups, the difference in good health between the lowest and highest socioeconomic groups is reduced (Graham and Kelly,

2004). There was one study that investigated differential intervention effects between management and blue-collar employees (Sorensen et al., 2005).

Most of the targeted interventions showed potential in decreasing inequalities in health behaviours. Employee guided and peer education programmes resulted in favourable effects in fruit and vegetable outcomes (Beresford et al.; 2010; Buller et al., 1999); whereas, another employee guided intervention decreased fat intake but did not change fruit and vegetable or fibre intake (Sorensen et al., 1998). An intervention incorporating individualised tailored computer messaging along with a peer helper support programme lead to increases in fruit and vegetable consumption (together and separately) but no change in fat consumption (Campbell et al., 2002).

The only targeted intervention with no employee guidance or peer support showed no favourable effects (Anderson and Dusenbury., 1999). This study explored the effects of a group-based or individual-based information provision and self-assessment intervention and found no intervention effects on fruit and vegetable, fat, fibre, bread, meat, dairy and sweets intake.

Sorensen et al (2005) investigated the effects of a multicomponent intervention (including environmental changes, family events and discussion group sessions) guided by an employee advisory board amongst managers and blue-collar workers. Overall, no changes in fruit and vegetable or red-meat consumption were observed. No differences in intervention effects in terms of fruit and vegetable intake were also observed between managers and blue-collar workers; therefore, although the intervention overall was unsuccessful, it did not lead to any widening of health inequalities.

2.8 Discussion

2.8.1 Summary of Findings

Results show that workplace dietary interventions can be successful in improving dietary behaviours amongst employees as the majority of interventions were successful.

The BCT ‘Provide information on consequences of behaviour in general’, and CAIs ‘labelling’ and ‘prompting’ (and the availability of fruit and/or vegetables to a lesser extent) would appear to have the most promise in increasing fruit and/or vegetable intake. The BCT ‘Provide information on consequences of behaviour to individual’, and the CAIs ‘availability’ of foods, ‘prompting’ (and to a lesser extent labelling) in the canteen/where the food is provided would appear to have the most promise in decreasing dietary fat intake.

Although fewer studies in this systematic review investigated interventions incorporating environmental changes, this seems to be an effective approach to changing individuals’ dietary behaviour (Brehm et al., 2011; Emmons et al., 1999; French et al., 2010a; French et al., 2010b; Glasgow et al., 1995; Sorensen et al., 1992; Hebert et al., 1993; Sorensen et al., 1996; Sorensen et al., 1998; Sorensen et al., 1999; Sorensen et al., 2005). Existing evidence supports this finding, that studies that have focussed on environmental changes plus education have been shown to have positive short-term effects on dietary intakes of participants’ (Geaney et al., 2016, Mackison, 2016, Volpe, 2015). There appears to be a trend to suggest that interventions incorporating a greater number of strategies (BCTs and CAIs) could be more effective at improving dietary behaviours (see Table 4). Although a small difference, successful interventions incorporated 0.9 BCTs and 0.3 CAIs more than unsuccessful interventions.

The majority of interventions using participatory and peer-support approaches were successful. Employee guided and peer education programmes resulted in favourable effects in fruit and vegetable outcomes (Beresford et al., 2010; Buller et al., 1999) and decreased fat intake (employee guided only) (Sorensen et al., 1998). Incorporating individualised tailored computer messaging along with a peer helper support programme has led to increases in fruit and vegetable consumption (Campbell et al., 2002).

Evidence to determine the effect of workplace dietary interventions on health inequalities was limited, but the majority of interventions targeting low SES

groups were successful at improving at least one dietary outcome, suggesting that these interventions do have the potential to reduce health inequalities. The one study that investigated differential effects across different SES groups saw no improvement but also no widening of the health inequality gap.

It was not possible to delve into the cost analysis or the effect of interventions on employee productivity, absenteeism and wellbeing in workplace dietary interventions as there is minimal evidence.

2.8.4 Strengths and Limitations of the Review

Existing systematic reviews have looked at the short-term effectiveness of workplace dietary interventions, but there is a need for higher quality, longer term evidence which previous reviews are lacking (Schliemann & Woodside, 2019; Wolfenden et al., 2020). This review gathers richer data from RCTs with a minimum duration of 12 months or more and helps identify the particular components that make dietary interventions in workplace settings effective. Using two well developed and recommended taxonomies (CALO-RE and TIPPME) this review helps identify the theory underpinning intervention design to facilitate an understanding of what works, why and how.

Strengths of this review are that the search strategy threw a wide net that captured a variety of studies, in any country, in any type of workplace. Studies in adults of all gender, socioeconomic status and nationality were included. However, the majority of studies were US based and therefore the review is not representative of the wider population. This has highlighted however that there is a distinct lack of UK based studies that aim to change dietary behaviours in UK workplaces.

A strength of this study is that it was conducted on RCTs, furthermore with a minimum study duration of 12 months or over were included. Excluding other study designs and placing a minimum study duration may have resulted in

potentially relevant and interesting studies being excluded. However, this review shows the long-term effects of interventions whereas studies with a shorter duration fail to do so, and the time limit and capacity justifies refining the inclusion criteria.

It was positive that a meta-analysis was possible within this review for interventions that targeted fruit and/or vegetable, and/or fat intake. However, the meta-analysis was limited to a small number of studies due to outcomes being reported in different ways and different follow up duration and different techniques for data collection, such as Food Frequency Questionnaire (self-reported data and researcher collected data). There were more included studies, but they were not eligible for meta-analysis. Therefore, the meta-analysis is not strong enough to base any recommendations on.

The risk of bias tool was adequate but due to lack of reporting in studies it was not possible to extract enough information to correctly rate the interventions, hence a lot of studies having unclear ratings. This did not necessarily reflect the quality of the studies, but more so the lack of reporting by study authors.

CALO-RE and TIPPME were useful tools but not always sensitive at distinguishing some important differences, e.g. format of information provision, frequency/dose of intervention components, participatory approaches.

2.8.5 Strengths and Limitations of the Included Studies

The main strengths of the included studies are the RCT design and that participants were followed for at least one year and, therefore, could provide an indication on the sustainability of effects. Another strength was that the population sample included low SES, and more ethnically diverse samples, and studies targeting specific individuals (blue collar workers, transport and automotive industries, firefighters, and service workers, older workers, retired workers, female workers, overweight workers.

Limitations included the difficulty in determining the risk of bias of many domains across all of the studies, and this was frequently attributed to the lack of reporting in studies. The high number of unclear risk of bias did not necessarily mean those studies were poorer in quality, but was attributed to poor reporting of intervention details. The tool was effective, but the lack of reporting in studies needs to be addressed.

A main concern is that the majority of the studies measured dietary outcomes using self-report tools that had not been validated for the assessment of intervention changes. Therefore, effects reported may be influenced by measurement factors such increased knowledge of dietary behaviour and, therefore, increased ability to report accurately and increased familiarity to the assessment tool.

The research is dominated by US based studies due to US workplaces having the responsibility of covering the health insurance costs of employees, therefore the workplace is incentivised to invest in the health and wellbeing of their employees. The findings from the review are applicable to other countries but other countries do not seem to invest as heavily in the health and welling of their employees. This emphasises the importance of costs and engaging management when designing interventions in the workplace setting.

Studies varied widely in sample size and study duration, with as few as 37 participants to as many as 3485 participants, and from 12 months duration to 60 months duration. Different follow up duration and sample sizes, coupled with different techniques for data collection, such as Food Frequency Questionnaire (self-reported data and researcher collected data) made it difficult to compare studies and accounted for the high heterogeneity in the meta-analysis. There were studies that reported the same outcomes but were not eligible for inclusion in the meta-analysis.

2.8.6 Subsequent Research

The majority of included studies were based in the US. There were only two studies from Europe (Netherlands). There is a need for more European, in particular UK based studies investigating the effect of dietary interventions on workforce behaviours and health.

Interestingly, there were some BCTs and CAIs used in a good number of interventions that were 70-73% successful and warrant further investigation. Similarly, for those techniques that were infrequently used, there is a requirement for more research into identifying why they are unpopular.

Few studies report productivity, absenteeism and wellbeing as outcome measures in workplace interventions. It would be particularly useful to have more studies to show which interventions and BCTs, CAIs are effective in terms of costs, to 'sell' the intervention to workplace management and catering companies, external caterers that provide food to the workforce.

There is a need to investigate whether the influential BCTs and CAIs in fruit and vegetable and/or fat intake interventions that were successful, can be applied to other diet outcomes, for example increasing fibre intake and reducing energy intake, and sugar sweetened beverages and sweet snacks consumption.

Emphasis must be on researchers and publication authors to ensure consistent, accurate, detailed reporting of the intervention and underlying behaviour change techniques utilised. This consistency would ensure more interventions could be include in subsequent meta-analysis and quality assessment, providing more robust and informative outcomes.

2.8.7 Implications for Practice

This review has identified that there is a need for studies to be implemented in UK workplaces, whilst providing a comprehensive overview of the evidence from predominantly US based studies. There is the opportunity to

learn from the US approach and invest more into the health and wellbeing of the workforce. To do this, workplace management need to get on board, and interventions need to use a participatory approach involving staff in intervention design and implementation phases. Using employee led, peer education and support, and utilising channels of communication in workplace settings such as computer messaging have proven to be effective intervention techniques. Individualised approaches work best, compared to group approaches. Interventions that provide information to the workforce and employ techniques such as prompting and/or labelling and/or increasing availability of foods seem to be effective and result in changes to behaviour in relation to increasing fruit and vegetable consumption and/or reducing fat intake.

2.8.8 Revisions to the Original Protocol

The initial electronic searches identified 6876 potentially relevant records following deduplication and 6597 were excluded based on the title and abstract screening. 279 full texts were screened of which 168 were excluded. 111 studies were eligible for inclusion in the review. In discussion with the supervision team, it was agreed that this number of records was too many to manage within the PhD timescale and for the purposes of this thesis; therefore it was decided to reduce the number of records by excluding studies based on study design and duration of follow up.

The revised inclusion criteria for the review were:

- Adults of all gender, socioeconomic status and nationality, with a mean age of 16 or older who are employed at the worksite.

- Interventions that target dietary behaviours that are based in any workplace in any country.

- Randomised Controlled Trials only.

- Studies with duration (intervention plus follow-up) of 12 months or over were included.

- Studies with a comparator (there was no restrictions on the type of comparator used in the study).

As the inclusion criteria for the review had changed to only include randomised controlled trials, the decision was made to use the Cochrane Risk of Bias Tool (described in Handbook version 5.1.0).

2.8.9 Conclusions

Workplace dietary interventions can change dietary behaviour and have shown to be particularly effective for increasing fruit and vegetable and reducing dietary fat consumption. The BCTs 'providing information' whether in general or specifically for the individual, and CAIs 'availability' of foods, 'prompting' and 'labelling' showed the most promise in interventions to change dietary behaviour.

Targeted interventions that incorporate employee guided and peer education programmes resulted in favourable effects in fruit and vegetable and/or fat outcomes. Making use of the workplace methods of communication and incorporating individualised, tailored, computer messaging along with a peer helper support programme has also led to favourable effects. This further emphasises the suitability of workplaces as a setting for behaviour change interventions. Targeted interventions showed potential in decreasing inequalities in health behaviours however there is a need for more studies within workplace settings with interventions that target subgroups of the workforce, and that report on wellbeing, productivity, absenteeism, and the cost of delivering a dietary intervention in workplace settings. Better reporting of interventions is needed to ensure consistent, accurate data is available for extraction, allowing for further analysis of intervention characteristics, and providing more robust and informative outcomes.

Chapter Three: A Qualitative Study Exploring the Views and Experiences of Delivering Dietary Interventions in Workplaces in the North East of England

The results of this qualitative study have been published in BMC Public Health (Appendix 9) (Smith et al., 2017).

3.1 Objective

As previously outlined in Chapter 1,the workplace has the potential to be an ideal environment for health interventions to tackle dietary behaviours (Lake et al., 2004, Black, 2008). Studies that have focussed on environmental changes and education have been shown to have positive short term effects on dietary intakes of participants' (Geaney et al., 2016, Mackison, 2016, Volpe, 2015). The results of the systematic review, as outlined in Chapter 2, demonstrate that there are Behaviour Change Techniques and Choice Architecture Interventions that can be utilised effectively in workplace-based interventions aimed at changing dietary outcomes, particularly fruit and vegetable, and fat consumption. The review further highlighted that there is a lack of evidence of UK-based workplace interventions. Few studies focus on the practicalities and implications when designing and implementing an intervention within UK workplace settings. Research exists that provides an overview of organisational workplace interventions, however there is limited information on practice or implementation. In addition, there is a need to evaluate any differential impacts of interventions by socio-economic status (Hillier-Brown et al., 2014, Lake et al., 2016).

The aim of the research study described in this chapter was to explore the perceptions and experiences of commissioners and deliverers in terms of designing and implementing dietary interventions within workplace settings. The intention was to identify the components of successful interventions in order to inform the development of future interventions.

The objectives were met with the help of the Northern Trades Union Congress (TUC) who implement the successful North East Better Health at Work Award (BHWA). The Better Health at Work Award (BHWA) is an established and evidence-based workplace health improvement programme, with a high coverage (21.4%) of the working-age population employed in the North East of England (Northern TUC., 2015; Better Health at Work Award., 2015). BHWA is a partnership between the 12 Local Authorities in the region, the Northern Trade Unions Congress (TUC) and the National Health Service (NHS), and was developed 'to give recognition and endorsement to those organisations that are committed to developing a sustainable culture of health and wellbeing in the workplace' (Braun et al., 2015). The BHWA gives support to workplaces and staff to offer the chance to be fitter, healthier and safer, and is free to all organisations, across sectors, of any size in the region. It involves over 400 employers and is therefore a potentially valuable resource to acquire knowledge of workplace interventions. Although the focus of the BHWA is determined by the needs and preferences of individual workplaces, most include advice and support in relation to healthy eating.

Health Advocates are employees of the workplaces signed up to BHWA and bring knowledge of the complexity of workplaces that needs to be taken in to account when designing and delivering an intervention in the workplace settings. They have first-hand experience of implementing interventions, and can offer perceptions of interventions being delivered, for example what interventions did the workforce successfully engage with and why. Health Leads have knowledge of the barriers organisations have come across and how they have overcome these. They had close links to BHWA and could provide information on what might need to be addressed at a commissioning level. Health Improvement Commissioners, employed by Local Authorities in the region, had knowledge in terms of funding BHWA, and a broad knowledge of organisations in the region delivering dietary interventions.

This chapter will describe the qualitative exploration of the knowledge and experiences of those delivering interventions via BHWA in workplaces in the North East of England.

3.2 Methods

3.2.1 Data Collection

A pragmatic qualitative approach, involving one-to-one semi-structured interviews with a sample of BHWA stakeholders, was employed to meet the above aim. This provided a framework for comparison between interviews, as well as allowing participants to raise additional issues. The BHWA has a number of stakeholders involved in delivering the scheme, see Figure 11. A convenience sampling approach was employed; although it entails a risk of bias, this approach is commonly used in exploratory and service development research (Robson, 2013). The study was designed to inform future intervention development and evaluation, rather than test or build theory.

An invitation email was sent by Northern TUC (Appendix 10) to Health Leads and Health Advocates within workplaces that have conducted a diet- or nutrition-related intervention (in the broadest sense). It is not possible to know exact numbers of health leads and advocates approached to take part. However, an estimated 118 organisations participated in the BHWA scheme in the financial year 2014-15 and there were multiple health leads and advocates per organisation. An email was also sent to those who had been involved in commissioning the BHWA (n=12) within local authority public health teams across the North East (Appendix 11). Individuals were invited to contact the researcher directly if they were interested in taking part, at which point they were given a copy of the Information Sheet outlining what taking part involved (Appendix 12) and asked to sign a consent form (Appendix 13). From those who responded to the initial invitation (n=14), three did not respond to follow-up emails. The final sample included three local authority commissioners of the BHWA, alongside two Health Leads and six Health Advocates within organisations who were part of the BHWA scheme.

Topic guides were written and reviewed by the authors. The topic guides were not pre-tested; however, after the first two interviews it was clear that minimal adaptations were needed and the guides were deemed fit for

purpose after minor changes were made. These changes included putting less emphasis on the interviewee's role and ascertaining whether there were on-site catering facilities at their workplace.

One-off interviews were conducted between June and August 2015 by telephone and digitally recorded, before being anonymised and transcribed verbatim. The interviews took pace at the interviewer and interviewees place of work, separately. Interviews were structured to identify respondents' experiences of commissioning, designing and/or implementing dietary interventions in workplace settings. The interviews tackled practical issues like *how* dietary interventions were implemented and *what* barriers and facilitators were identified to delivering successful dietary interventions within workplace settings. Finally, any training needs and or support were identified. The mean length of the interviews was 23 min (range 9–38 min). One interviewer (SS), the student researcher and author of this body of work who has extensive experience of qualitative research, conducted all interviews. The interviewer and participants did not know one another; apart from an email to arrange the interview, no previous contact had been made. Observational notes were taken after interviews on the structure of the interviews, and the general flow of the discourse to later allow for any amendments to be made to the interview schedule. Participants did not receive copies of their interview recording, transcripts or notes, and did not provide any feedback on the interviews.

3.2.2 Data Analysis

The interview data were analysed, with a second researcher (C'OM) independently analysing a sample of four transcripts. The transcripts were analysed using a combination of thematic and framework analysis; systematic thematic content analysis is an adaptation of grounded theory incorporating thematic and content analysis (Burnard et al., 2008);the latter involves a systematic approach to qualitative data analysis to reduce researcher bias and increase the reliability of the analysis (Ritchie and Spencer, 1994).

Analysis took place manually to ensure continued immersion in the data. Transcripts were divided into sections and arranged into themes and sub-themes. The researchers' analyses were compared to establish reliability with agreement on themes emerging from the data. There were no disagreements between the two researchers. No new themes were identified after interview nine, therefore data saturation was met. The interviews followed an interview schedule as follows:

Interview with Health Improvement Commissioners;

1. What is your job title and your role (including where you work)?
2. Whose responsibility is workplace health within your organisation?
3. What was/is your involvement in developing interventions?
4. Are you aware of any workplace interventions that target dietary intake? What are these/can you give some examples?
5. How were the interventions delivered? By whom?
6. How were the interventions received by the workforce?
7. What was the impact of these interventions on the workforce/workplace?
8. At the development stage for these interventions, were there any barriers/facilitators in setting these interventions up? What were these?
9. Were there any barriers/facilitators during the implementation of these interventions? What were these?
10. Are there any training needs, information and/or support required in order to improve provision and success of dietary workplace interventions?
11. Is there any information and/or support you feel is needed to change policy and current practice in relation to dietary interventions in workplaces? At commissioning level and workplace level?

Interview with Health Leads;

Introductions and state the purpose of the interview.

1. What is your job title and your role (including where you work)?
2. Whose responsibility is workplace health within your organisation?
3. What is your role regarding workplace health within your organisation?
4. Are you aware of any workplace interventions that target dietary intake?

5. What are these/can you give some examples?
6. What was/is your involvement in developing these interventions?
7. How were the interventions delivered? By whom?
8. How were the interventions received by the workforce?
9. What was the impact of these interventions on the workforce/workplace?
10. At the development stage for these interventions, were there any barriers/facilitators in setting these interventions up? What were these?
11. Were there any barriers/facilitators during the implementation of these interventions? What were these?
12. Is there any information and/or support you feel is needed to change current practice in relation to dietary interventions in workplaces? At commissioning level and at workplace level?

Interview with Health Advocates:

Introductions and state the purpose of the interview.

1. What is your job title and your role (including where you work)?
2. Whose responsibility is workplace health within your organisation?
3. What is your role regarding workplace health within your organisation?
4. How did you become interested in workplace health?
5. Are there any workplace interventions within your workplace that target dietary intake?
6. What are these/can you describe them?
7. What was/is your involvement in developing these interventions?
8. How were the interventions delivered? By whom?
9. How were the interventions received by the workforce?
10. What was the impact of these interventions on the workforce/workplace?
11. At the development stage for these interventions, were there any barriers/facilitators in setting these interventions up? What were these?
12. Were there any barriers/facilitators during the implementation of these interventions? What were these?
13. Is there any information and/or support you need to change current practice in relation to dietary interventions in your workplace?

Analysis adapted the Social-Ecological Model (SEM) of health promotion. The model considers the interplay between individual, interpersonal, community, and societal factors and aims to guide intervention development targeting dietary behaviours in workplaces. The overlapping circles of the model demonstrate how factors at one level influence factors at another level.

3.3 Ethical Approval

All data relating to the study has been treated as confidential and stored securely in accordance with the Data Protection Act 1998. The study was approved by the Research Ethics Sub-Committee within the School of Medicine, Pharmacy and Health at Durham University (ESC2/2015/07) (Appendix 14). This study was conducted in line with the COREQ checklist (Tong et al., 2007), see appendix 15.

3.4 Results

3.4.1 Study Sample

The final sample included local authority commissioners (n=3), alongside Health Leads (n=2) and Health Advocates (n=6) within organisations who were part of the BHWA scheme. Participants were from a range of workplaces with a wide geographical spread across the region, based in Teesside (n=3), Hartlepool (n=2), Newcastle (n=2), Redcar and Cleveland (n=2), Northumberland (n=1) and County Durham (n=1). Job roles included health and safety officer, health trainer, medical professionals (such as a qualified nurse), administrators and public health commissioners. Six interviewees were public sector workers employed by borough councils, while five worked for private industries. Figure 11 is a breakdown of participants by their job role.

Figure 11: Breakdown of the Participants by Role

Health Improvement Commissioners

Health Improvement Commissioners, employed by Local Authorities in the region, have knowledge in terms of funding BHWA, and have a broad knowledge of organisations in the region delivering dietary interventions.

Health Leads

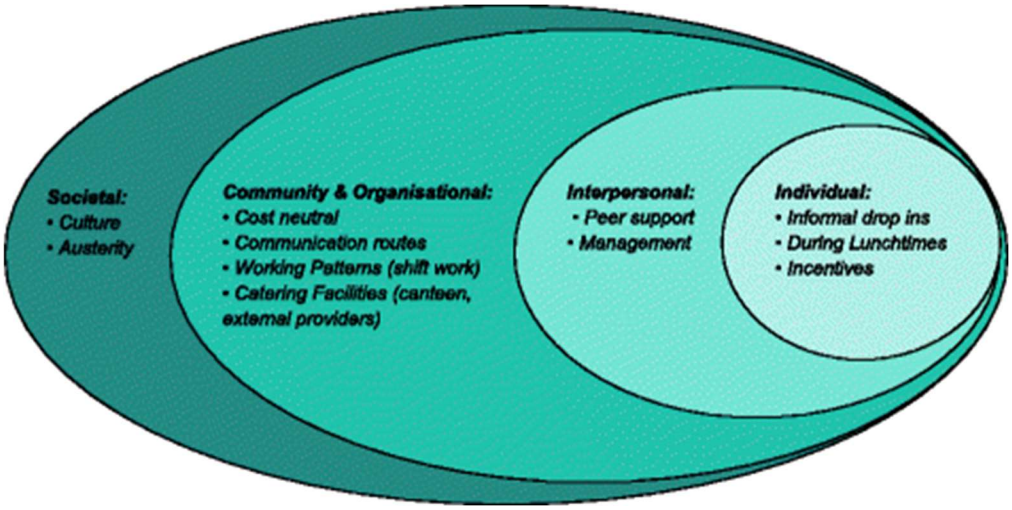
Health Leads have knowledge of the barriers organisations come across and how they overcome these. The local Health Leads help to train Health Advocates within the workforce.

Health Advocates

Health Advocates are employees of the workplaces signed up to BHWA and bring knowledge of the complexity of workplaces that needs to be taken in to account when designing and delivering an intervention in workplace settings.

This analysis adapted the Social-Ecological Model (SEM) of health promotion to a four level ecological model designed to better understand workplace dietary behaviours. Themes from interviews were grouped into these four levels influencing dietary behaviour, which were subdivided into specific factors, see Figure 12.

Figure 12: Adapted Socio-Ecological Model (SEM) for Workplace Dietary Behaviours



3.4.2 Level 1: Individual Factors Influencing Dietary Behaviour at Work

Interventions involving delivery of health messages in an unstructured manner (rather than structured content and having to attend every week) were perceived to be successful. Furthermore, if sessions were conducted at lunchtimes, attendance was reported to be good as staff were not required to use flexi-time. Offering incentives was also felt to enhance uptake, although, interestingly, non-monetary incentives, such as stress balls, free swimming or gym sessions, were perceived as most popular. Examples of existing workplace interventions are listed in Figure 13.

'Freebies. People love something free, even if it's a stress ball … it's not the monetary value, it's just to have something tangible'

(Health Advocate 7)

Figure 13: Examples of Existing Workplace Interventions as Identified from Interviews

Category 1: Provision of healthier free foods: free fruit days, healthy food tasting sessions

Category 2: Changes to the canteen environment: traffic light system on products, healthy salad bars, posters in the canteen promoting healthier options, provision of healthier products in vending machines

Category 3: Providing tools to aid dietary change: healthy eating plate, food diaries, leaflets/booklets on portion control, salt intake, grains, how to read food labels, provision of healthy recipe files

Category 4: Electronic resources: directed to websites providing info on healthy eating, staff emails received with information on healthier options and lifestyles, staff intranet has healthy recipes and campaigns, electronic booklets on portion control, salt intake, grains, how to read food labels

Category 5: Free sessions aimed at dietary change: talks on mood, food, healthy eating

Category 6: Free sessions aimed at weight loss/management: unstructured weight loss groups, unstructured weight management groups, provision of free vouchers to SW

3.4.3 Level 2: Interpersonal Factors Influencing Dietary Behaviour at Work

3.4.3.1 Peer support

Interventions involving attendance with other colleagues for peer support were perceived to be successful and encouraged individuals to take part in initiatives. In one organisation, short weight management sessions were delivered during lunchtimes and were received positively.

> *'And that went down well in terms of the peer support… people enjoyed the 10 minutes with each other, you know, supporting each other so that was really good'*
>
> (Health Advocate 3)

3.4.3.2 Management

The importance of the involvement of management was highlighted. If managers were supportive, in terms of staff accessing initiatives, this was perceived as having a positive impact on uptake and retention, and the converse was also true. Increasing knowledge amongst management of the positive relationship between investing in employee health and reduction in absenteeism rates, and subsequent increases in productivity, was thought to be beneficial.

> *'So sometimes it is just finding some sort of carrot, and that usually does relate to the chief exec. You know, "The chief exec has asked for this or he really supports this", and that helps bring people on board.'*
>
> (Health Advocate 3)

However, sometimes management was felt to represent a barrier that could not be overcome, particularly in the case of changes in company ownership, which often brought a cultural conflict in views on health, as illustrated by the quote below.

'it was a different management style and a different plant director, he didn't promote health at all. He thought … if you had anything wrong with you that you had to go out and pay for it and the company weren't going to fund anything… everything was taken away and even the stuff from the canteen, like the subsidised, that was all removed, and it was like, "go and look after yourself"'

(Health Advocate 2)

3.4.4 Level 3: Community/Organisational/Environmental Influences on Dietary Behaviour at Work

3.4.4.1 Cost

At the time of conducting the research, workplaces were being stretched and workplace initiatives targeting dietary behaviour were perceived to be less of a priority as a result. Participants reported that canteens were being closed, and healthy food provision was no longer seen as important. To incentivise management to invest in employee health, participants felt that interventions must be cost-neutral.

'it's money saving, cutbacks, and the food is the first thing to go'

(Health Advocate 6)

'they're (management) pretty good, they usually say ok, as long as it doesn't cost, cost is minimal and it won't take much manpower'

(Health Advocate 7)

3.4.4.2 Communication routes

Offering interventions at the workplace was in itself seen as a facilitator to uptake and completion as people were easily contactable on site. Using the various communications channels available in a workplace, such as email, staff intranet, and posters in the canteen, was perceived to be useful in

recruitment and retention. Emails that prompted and encouraged staff to continue were seen as particularly useful.

'if it's delivered in your organisation, it's easier because you've got peoples emails to hand, they're on a directory and things like that, so facilitating that, that's one side that's easier'
(Health Lead 2)

3.4.4.4 Working patterns

Participants reported that there were particular groups within the workforce that may be at risk of missing out on initiatives and healthier food provision. These included shift workers and truck drivers who reportedly experienced barriers to taking part in initiatives due to working antisocial hours, often during the night, when most initiatives were delivered during the daytime.

'A lot of shift workers there, and of course that sort of thing is a barrier because the award generally only happens during the day…. (the award) didn't stop them getting the takeaways at one o' clock in the morning, but that's just the way it is'
(Health Lead 2)

3.4.4.5 Catering Facilities/Food provision

It became apparent through the interviews that some workplaces had little or no food provision on site and limited access to healthy food; for example, vending machines as the only option. Due to the lack of food provision, employees were relying on alternative sources, such as external food outlets and mobile caterers. Often the food options available for purchase were unhealthy in content and size. Shift workers reportedly tend to obtain food offsite from takeaway facilities and mobile caterers and therefore miss out on onsite food provision, for example, healthier canteen options.

'We've lost what used to be the canteen … We have the sandwich man, as we call him. Well his food's pretty good but, you know, he

brings big double-sized buns in instead of single-sized buns. He brings too much of a selection of chocolate when he hardly sells any but it's all in front of you. You know, he never brings any fruit in…. it's generally all stodge'

(Health Advocate 1)

'I do know some places that are in the middle of nowhere and the only thing that comes round is a van. Now while they may do something like a cottage pie or a baked potato, other than that it's burgers and really high fat greasy foods which are not particularly good, but it's what people want because it's the quick fix'

(Health Lead 2)

3.4.4.6 Features of work

The type of work can impact on participation; for example, chemical sites have designated areas for eating that must be adhered to, so initiatives were restricted to reception areas, the canteen, or occupational health. Not all staff access these facilities and therefore some miss out on the opportunity to take part. Furthermore, chemical and engineering plants are often very large in size, which can be a barrier to initiatives reaching staff across the site.

'it depends on the kind of facility we're working in. I mean obviously if you've got a steel foundry you're not going to be able to do much in there, particularly if they haven't got a canteen…'

(Health Lead 2)

3.4.5 Level 4: Societal Influences on Dietary Behaviour at Work

There are broader societal factors identified that influence workplaces in terms of encouraging healthy eating and making healthier dietary choices obtainable.

3.4.5.1 Culture

Amongst employees, there was a sense coming from management that the workplace was solely a place of work, and that this impacted on the likelihood of employees engaging with initiatives.

> *'At the end of the day these people are in work and these people work to make a profit for their employer…. So actually releasing people [to take part in activities] can be quite difficult'*
>
> (Health Lead 1)

This 'work'place culture became more problematic when coupled with companies being target-driven, as these targets tended to take priority over staff health and wellbeing. Target driven workplaces were industries that employed a range of workers, including white collar (general office workers, administrative); blue collar (manual work); and grey collar (principally white collar but perform blue collar tasks such as skilled technicians, engineers). Subsequently an increasing proportion of participants were reported to be working through lunch without eating at all.

> *'Targets were the main issue. And I had to give up the healthy living group while we were really target-driven. I think it's just people's workloads'*
>
> (Health Advocate 10)

There was a clear association with management and workforce participation in workplace initiatives, but there was also the wider influence of societal attitudes towards work, particularly in relation to differences between the private and public sectors. Although seen in the private sector, there was perceived to be a greater feeling of being conflicted amongst the workforce in public sector roles to participate in health initiatives. Public sector workers were doubly conflicted; firstly, taking time away from work to attend the initiatives; and secondly that the work they were taking time from was publicly funded.

'it's trying to convince them to take part, but then again it all comes back to the funding, because they're funded by public money'
(Health Advocate 3)

3.4.5.2 Austerity

The study took place during a time of austerity, which was perceived to have an impact on workplace health due to reported cutbacks in the provision of healthy food, not least the closure of canteens. Participants described how the workforce were feeling the economic situation and opting for cheaper alternatives that were often higher in calorie content and poor nutritional content.

'I do know some places that are in the middle of nowhere and the only thing that comes round is a van. Now while they may do something like a cottage pie or a baked potato, other than that it's burgers and really high fat greasy foods which are not particularly good, but it's what people want because it's the quick fix'
(Health Lead 2)

3.5 Discussion

It is recognised that the workplace is a good setting in which to deliver health-promoting activities. In this study, dietary workplace initiatives perceived as being successful were those that were delivered in an unstructured capacity (rather than structured content and having to attend every week), at convenient times, and involved colleagues' support. Initiatives being well-advertised and communicated via different avenues, as well as offering an incentive, were also reported to be facilitators to recruitment and retention.

This study has identified several inter-linked factors within workplace settings that influence dietary behaviours. The SEM model suggests that workplaces under financial pressure (austerity) may result in a management decision to

close onsite catering and canteens. Without an onsite price-competitive canteen the workforce often relies heavily on external sources of catering and food provision whilst at work. This was an unexpected finding and one that warrants further exploration. Food provided by these external sources, such as takeaways and food outlets that pitch nearby or on site (the 'sandwich man' or 'van') was reported to be of poor nutritional quality and served in large quantities.

Whilst studies exist to show that physical changes in the workplace food environment can have short term favourable effects on dietary choice (Lake et al., 2004, Black, 2008., Geaney et al., 2016, Mackison, 2016, Volpe, 2015), there are no existing studies that have explored the nutritional quality of food available at workplaces (the workplace food environment). Studies are needed that gather data on what food is available to the workforce, from which providers (e.g. staff canteen versus external providers in the surrounding area), and when (daytime hours, evenings shift work patterns).

Furthermore, the findings from this study highlight the possibility that workplace dietary interventions could contribute to inequalities by benefitting those less-disadvantaged (Intervention-Generated Inequalities or IGIs) (Hillier-Brown et al., 2014). This study has identified that shift workers are reportedly disadvantaged due to working antisocial hours, often during the night, when most initiatives were delivered during the daytime. Coupled with the remoteness of some sites, the large size of sites, the nature of the work conducted, and closure of canteens, shift workers cannot access healthier options that other members of the same workplace can.

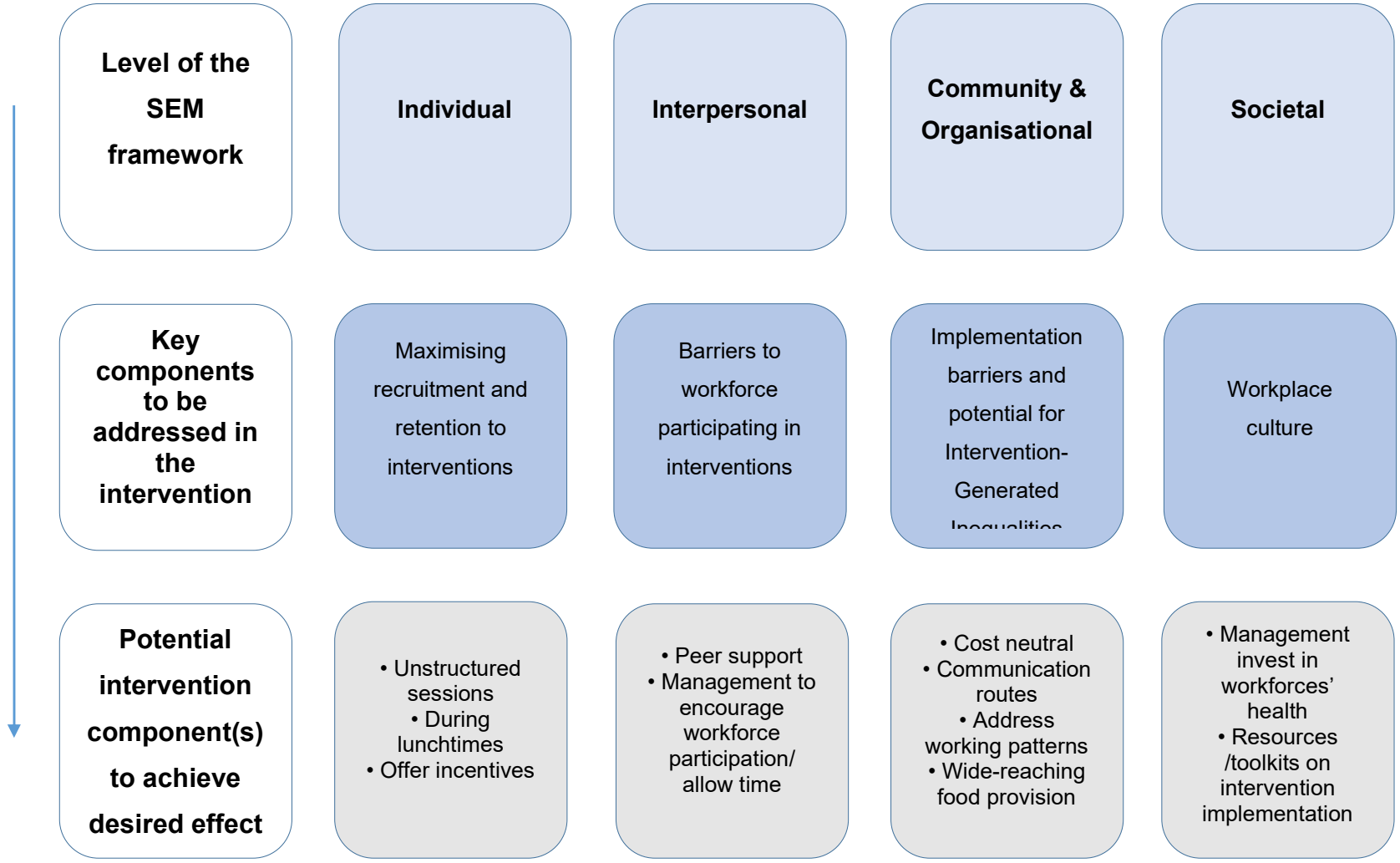
It is clear from the findings of this study in relation to the SEM and the emerging workplace IGIs, that multi-component ecological interventions are required that address the wider context rather than individual behaviour change interventions that can exacerbate inequalities. There is evidence that structural workplace interventions, provision of resources and fiscal interventions such as tobacco pricing show some evidence of reducing inequalities (Lorenc et al., 2013). A review by Hillier-Brown et al (2014) also

showed that ‘upstream’ preventative interventions are less likely to increase health inequalities than ‘downstream’ interventions.

The components identified from this work that are feasible to implement when developing future workplace interventions are outlined in Figure 14. A key finding from this study is that in order to be able to develop and deploy a workplace intervention it is crucial to actively involve those responsible for management. Only with their involvement can interventions be successfully implemented and barriers to participation eliminated. Employees feeling able to, and comfortable with attending initiatives ‘guilt-free’ hinged on management’s attitude towards them taking time away from work to take part. Linnan et al. (2007) found that few managers (41%) agreed that employers have a responsibility to encourage employees to make healthy lifestyle choices. There was disbelief that investing in the workforce in terms of health would see an improvement in recruitment, retention and productivity. The study went on to show that managers considered the main barriers to implementing initiatives to be lack of employee time to participate, lack of staff time, production conflicts, and cost of offering the programme. It is important that managers understand the short- and longer-term outcomes of unhealthy diets and what their business can stand to gain from interventions targeting healthier eating behaviours. Shaping management outcome expectations and beliefs that an intervention can be successful with their support is paramount (Bandura, 2004). Intervention deliverers will stand to gain if time and resources are invested in shaping management beliefs and expectations before an intervention is implemented.

Profit-making is essential to successful business, therefore, to appeal to management, interventions must be designed to be simple to implement and cost-effective or indeed cost-neutral. Cost analysis of interventions is limited and would be useful for employers’ in informing what type of intervention is feasible, in both the short (implementation) and long term (maintenance). For example, the cost of implementing an environmental intervention has been shown to be marginal compared to nutrition education (Fitzgerald et al., 2016).

Figure 14: Model of Key Feasible Components to Implement When Developing Future Workplace Interventions



Workplace culture needs to be considered when designing and implementing future workplace interventions and the impact management can have on recruitment and retention. Fitzgerald et al (2016) found that employees appreciated the investment employers made in the intervention and were reassured that their employer concerns were not just about profit-making.

Crump et al. (1996) found that support from management improved employee participation but only in certain subgroups of the workforce, with blue-collar workers more likely to be influenced by management support than white collar workers. Linnan et al (2007) demonstrated that 'different levels of managers vary in their beliefs' with regards to health promotion at work. Even in large organisations the role of a single individual can be crucial in shaping what is on offer. Previous research on how to implement change can potentially support future endeavours that would need to first target these individuals in order to then be able to bring about change.

Training is required at a high level so that health-promoting messages can be cascaded throughout the workforce. Guidance, in particular toolkits around how best to deliver an intervention in the workplace, is needed.

Mentoring and support from other workplaces that have had success with dietary initiatives would be useful, as would network opportunities to between workplaces. Cross-collaborative working between workplaces (management) and outside catering companies (responsible for vending machine supplies) and external food outlets and caterers (sandwich man, van man, takeaways in close proximity to worksites) could address many of the issues identified in terms of ensuring access to healthier food in the workplace.

3.6 Strengths and Limitations of the Study

A strength of this study are that Health Leads and Health Advocates who participated were from a range of workplaces covering a wide geographical spread across the North East of England. Limitations of this study include the

small sample size, convenience sampling approach and associated risks of bias, despite every attempt being made to recruit additional participants to the study. Perhaps the study involving being interviewed and asked to comment on current employment roles was off-putting.

Another limitation is that the interview participants were predominantly from large engineering and chemical processing sites that employ hundreds of staff. There was no representation from small businesses in the study. This is interesting, that uptake of small businesses to the BHWA award was low. In addition, this could highlight that working for a small business may be a contributing factor to lack of access to health promoting initiatives in the workplace. Although enlightening in terms of revealing barriers to intervention design and delivery in large worksites, and the impact of shift work, the sample is not representative of the wider North East of England working demographic.

3.7 Conclusion

It is evident that workplaces are a suitable setting for interventions targeting dietary behaviour change and that there is an increasing demand for such initiatives (in light of the health inequities created by workplaces). The socio-ecological model indicates that when aiming to change dietary behaviours in workplaces, future interventions should not only consider individual and peer influences, but also management and other stakeholders (including employees and catering suppliers). Specifically, strategies aimed at the community level may be better placed. It is paramount that any strategies implemented are inclusive of all staff and consider the individual needs of the workplace and the workforce i.e. size, location. A focus on shift working patterns and addressing the availability and quality of food provision on and offsite is warranted to avoid increasing health inequalities.

Chapter Four: Exploring the Broader Workplace Food Environment and the Perceptions of Workplace Food Providers

The qualitative study outlined in Chapter 3 suggested that, as a result of austerity measures and managerial decisions, canteens were closing, and the workforce were relying heavily on external mobile caterers and takeaways for food whilst at work. Whilst studies exist to show that physical changes in the workplace food environment can have positive effects on dietary choice (Lake et al., 2004, Black, 2008., Geaney et al., 2016, Mackison, 2016, Volpe, 2015), there are no existing studies that have explored the nutritional quality of food available at workplaces (the workplace food environment).

The need to gather data on what food is available to the workforce, from which providers (e.g. staff canteen versus external providers in the surrounding area), and when (daytime hours, evenings shift work patterns) resulted in the design of this study. Understanding the workplace food environment enables comparisons between providers, and best informs how workplaces can improve food provision and encourage uptake of healthier options amongst workers.

4.1 Objectives

The aim of this study was to identify what food is available to the workforce, from which providers (e.g. staff canteen versus external providers in the surrounding area), and when (daytime hours, evenings shift work patterns); and to identify CAIs in the workplace food environment.

4.2 Methods

4.2.1 Development of a Food Environment Checklist

A Food Environment Checklist was developed specifically for this study and designed to capture as many elements of the food environment as possible (see Appendix 16). An existing Checklist, first used in the Foodscape Takeaway Masterclass study and designed by the primary supervisors, was

used to help inform the development of this Checklist. The Foodscape study Checklist was designed specifically for the evaluation of catering practices and menu availability in out-of-home food outlets and incorporates criteria set by the Chartered Institute of Environmental Health's Healthy Catering Commitment (Hillier-Brown et al, 2019). Having previously shown to be highly effective at gathering data on food availability, and used successfully in food outlets not dissimilar to workplace canteens, the Foodscape Checklist could be used confidently in this research project knowing that all food environmental factors were covered ensuring high quality data was collected.

Information gathered by the Checklist included canteen/mobile caterer opening times, seating capacity, types of foods available (hot and cold meals, prepacked sandwiches, takeaways), facilitators and barriers to healthy eating (i.e. nutritional labelling, meal deals, promotions on 'healthy' and/or 'unhealthy' options, portion sizing), comparative pricing (sum of individual items more or less compared to meals deals, smaller portions compared to regular sizing, 'healthier' options compared to regular). Detailed information was included in the Checklist on the food options available and evidence of healthier alternatives (i.e. potatoes and rice alternatives to chips for example, low(er) fat and/or sugar versions available (sauces, condiments, milk, sweeteners) healthier dessert options (yogurt, fruit salad), diet versions of drinks). Space was provided to include additional observational details.

The Checklist was adapted to be suitable for use in canteens and at mobile catering sites. For the purposes of this study, cooking methods and ingredients lists were removed from the checklist as the aim of this study was not to observe and provide recommendations for changing cooking or preparation techniques, rather this study aimed to audit what food and drink items were available for employees to purchase.
The checklist was amended to include time of observation and opening times of the catering establishments observed, to ensure data was captured on when people ate as well as what they ate as set out in the objectives of the study. Details of the seating arrangements in and around establishments was another addition to the checklist to capture data on whether particular

establishments were takeaway only or more of a social eating environment, and whether different workers were attracted to particular catering establishments.

As well as ensuring high quality data was collected, the adaptations to the Checklist created an in-depth tool that could be used by individuals unskilled in collecting data from observations of food environments and removed the reliance on self-report from caterers. Furthermore, the Checklist became an effective tool for use at different catering establishments, not just takeaways, but also cafes, restaurants, large and small establishments, and mobile caterers.'

4.2.2 Pilot Testing the Checklist and Subsequent Amendments

The Food Environment Checklist was piloted at a workplace canteen that was open to the public and at a mobile catering van at a sporting event. Two individuals (one familiar with food observation data collection, the other unskilled) simultaneously completed the checklist whilst comparing their choices. This pilot was useful in highlighting several amendments to the checklist, specifically: the section on 'healthier desserts' needed clarifying so was amended to include examples such as 'fruit salad, and 'yogurt'. The section on 'healthier snacks' originally included 'flapjacks' but it was thought as flapjacks were high in sugar that they were better placed in the 'cakes, pastries, cookies' section.

Quite a few promotions were meal deals and individual items were not available to purchase; therefore it was not possible in some instances to complete the comparative pricing. 'Fried rice' was not offered in any of the establishments so the 'boiled rice as an alternative to fried rice' section was unfairly checked negatively, therefore was amended to 'boiled rice offered as an alternative' which was applicable to many establishments as an alternative to chips for example.

The checklist included noting if 'oily fish' was offered and originally was only applicable if 'fresh tuna' or 'fresh salmon' was provided, however after some discussion 'tuna mayonnaise' was noted on the checklist but the wording of

this section remained unchanged as a compromise. The motive was to capture as much information on food options, but it is acknowledged that tuna mayonnaise has a different nutritional content and quality to fresh tuna.

During pilot data collection, observations were made regarding saltshakers at the mobile caters. Subsequently, a note was included on the checklist of the number of holes in the salt shakers as a barrier or facilitator to healthy eating (fewer holes was considered a facilitator as less salt was dispensed on the food, *vice versa* more holes were considered a barrier as more salt was dispensed). Evidence exists to show that using reduced-holed salt shakers (5 holes) in Fish & Chip takeaway shops, where these shakers are more commonly used by customers, is associated with lower sodium content of meals (Goffe et al., 2016a; Goffe et al., 2016b)

4.2.3 Recruitment

Details of the study participants, recruitment methods, and data collection are summarised in Table 11 with further explanation in the following sections.

4.2.3.1 Recruitment of Workplace Canteens

Health Leads and Health Advocates (n=11) that took part in interviews as part of the qualitative study gave their consent to be contacted further with information on additional studies. The Health Advocates were particularly engaged with this research and were in a prime position within their workplace to approve, or obtain approval, and grant permission to access their worksite. Health Advocates were approached via email (Appendix 17) with information regarding this proposed study. They were sent a copy of the Information Sheet (Appendix 18) and Consent Form (Appendix 19) and invited to take part.

Table 11: Summary of Participant, Recruitment and Data Collection Methods

Participants recruited	Method of recruitment	Data collected	Method of data collection
Canteen 1 (workplace) (n=1)	Health Leads and Health Advocates contacted workplaces; and online searches for worksites in the locality	Food audit, photographs of canteen layout and vending machines, food environment cues (TIPPME)	Onsite accessibility to canteen approved, Food checklist
Canteen 2 (industrial worksite) (n=1)	Site was accessible to the public	Food audit, photographs of canteen layout, food environment cues (TIPPME)	Secret shopper, Food checklist, field notes
Canteen Management (n=2)	Via workplace management forwarding on information sheet and consent form	Qualitative interview data	Pre-arranged, semi structured audio recorded interview
Mobile Catering vans (n=6)	Online searches; driving between industrial sites; initially emailed or face-to-face contact made	Food audit, food environment cues (TIPPME)	Secret shopper or vendor self-reported Food checklist
Mobile Catering vendors (n=6)	Face-to-face contact	Conversational data	Ad hoc conversation whilst auditing the van, field notes
Mobile Catering van users (n=0)	na	Limited food preferences noted from items purchased	Limited ad hoc discussion whilst auditing the van, field notes
Cafes/restaurants industrial sites (n=3)	Sites were accessible to the public; initially emailed or face-to-face contact made	Food audit, food environment cues (TIPPME)	Secret shopper, Food checklist, field notes

Health Leads approached workplaces with canteens in the region to invite them to consider taking part. In addition, an online search was conducted to identify other potentially suitable workplaces in the region, of similar size and characteristics to those identified from past studies. Initial contact was made via email/post/telephone call initially to identify and reach out to the appropriate individual at that site. Workplaces that were interested in taking part were offered an Information Sheet (Appendix 20) and Consent Form (Appendix 19).

4.2.3.2 Recruitment of Mobile Catering Vendors

Online searches, using search engines (Google) and social media (Twitter, Instagram, Facebook) were conducted for catering outlets such as mobile vans in the Teesside area. A recruitment effort was made by driving around industrial and retail sites in the Teesside locality as it was observed that mobile caterers tended to pitch in such areas around about lunchtime. Once located, the mobile catering vendor was approached via email or in person at their pitch, offered an Information Sheet (Appendix 21) and Consent Form (Appendix 19) and invited to take part.

In addition to mobile caterers, other catering outlets in the locality of the workplace (restaurants/cafes) were identified during the recruitment process, which provided food and were frequented by local workforces. Located in units on industrial sites, these establishments were close to the mobile caterers' pitches. Staff at the sites were approached to take part via email. Where necessary, drinks and foods were purchased to ascertain portion sizes and ingredients from mobile caterers and restaurant/café sites.

4.2.3.3 Onsite Observations and Data Collection

One day was spent in each workplace, and each workplace was visited on separate days. Workplaces were visited on the same day of the week (Tuesday) to aim for some consistency across worksites. Observations of food and drink sales across all sites took place over lunchtimes, between the hours of 11:00 and 14:00. This was deemed a suitably long timeframe to capture those who dine earlier and later than the typical 12 noon.

Observations included what food and beverages are available on that day, what was purchased and also photographs were taken (with permission) capturing the food environment and food items.

One-to-one semi-structured interviews were conducted when possible with workplace canteen management/staff and mobile catering vendors. The interviews were conducted in the participants' place of work. In addition, brief one-to-one semi-structured interviews were conducted with the canteen users in the canteen. Potential participants were approached in person and offered an Information Sheet (Appendix 22) and Consent Form (Appendix 19) and invited to take part. All interviews were digitally recorded when possible, anonymised and transcribed verbatim. The interviews were designed to identify what the bestselling options are, what changes are felt would be feasible, acceptable and affordable as well as other emergent themes identified through the transcripts. The interviews followed the interview schedule (see Figure 15) which was used as a guide to prompt interviewees, with questions asked in any order depending on discourse, with some questions being adapted and then applied to other interviews for continuity.

4.2.4 Data Analysis

4.2.4.1 Checklist and Observations

At workplace canteens, and mobile and external caterers, the Food Checklist was completed, on-site observations recorded, and when possible, photographs taken of the food environment. The checklist data was used to produce comprehensive descriptions and tables of food and beverage items on. The tables include both hot and cold options available at all sites, plus healthier alternatives, with price comparisons (Appendix 23).

During on-site observations and using photographs taken of the food environment, an attempt was made to identify any choice architecture interventions as outlined in Hollands (2017) which was utilised alongside the CALO-RE taxonomy for coding behaviour change techniques in Chapter 2.

Figure 15: Interview Schedule

Interview with Canteen Management/Staff:

1. What is your job title and your role (including where you work)?
2. What types of food and drinks are provided on site?
3. Where can food and drinks be purchased on site? Vending machines? Mobile caterers/van? Canteen? Tea trolley?
4. Whose responsibility within your organisation is selecting the food available in the canteen/on site?
5. What is your involvement in deciding what food and drinks are provided on site/in the canteen?
6. What are the bestselling foods, drinks and meals in the canteen? Can you give some examples?
7. Who accesses the canteen?
8. Is the canteen well attended amongst the workers here?
9. Are you part of a healthier workplace initiatives?
10. Are there healthy options and alternatives offered in the canteen? Can you give some examples?
11. Have there always been healthy options/alternatives? If not when and why were they introduced?
12. What changes do you think could be made to food provision in the canteen to promote healthy eating?
13. Do you think the workers would welcome such changes to food provision and offering healthier alternatives?
14. What do you think are barriers/facilitators to changing food provision in the canteen and offering healthier alternatives?
15. Is there any information and/or support you feel is needed to change policy and current practice in relation to food provision in workplaces? At management level?

Interview with Mobile Catering Vendors:

1. What is your role (including where you work)?
2. Are you the owner of this business? Or do you work for someone else?
3. How many vans/mobile catering facilities do you/they own and are in use?

4. What types of food and drinks does your van/business provide?
5. Whose responsibility within your business is choosing what food is provided in the van/business?
6. What are the bestselling foods, drinks and meals from the van/business? Can you give some examples?
7. Who accesses the van/business?
8. Is the van/business well attended amongst the office/site workers in the area?
9. Are there healthy options and alternatives offered by the van/business? Can you give some examples?
10. Have there always been healthy options/alternatives? If not when and why were they introduced?
11. What changes do you think could be made to food provision by your van/business to promote healthy eating?
12. Do you think the workers would welcome such changes to food provision and offering healthier alternatives?
13. What do you think are barriers/facilitators to changing food provision from the van/business and offering healthier alternatives?
14. Is there any information and/or support you feel is needed to change guidelines and current practice in relation to food provision by mobile caterers?

Interview with Canteen and/or Mobile Catering Users:

1. Do you use the canteen/mobile caterer every day?
2. Why do you choose to use the canteen/mobile caterer?
3. Are you interested in healthy options and alternatives offered by the canteen/mobile caterer?
4. How do you identify healthier options in the canteen/mobile caterer? Signposting, posters, traffic light scheme, educational materials etc.?
5. What changes do you think could be made to food provision by the canteen/mobile caterer to promote healthy eating?
6. Do you think you would welcome such changes to food provision and offering healthier alternatives?

4.2.4.2 Interview Data

One-off interviews were conducted between April and June 2017. One female interviewer (SS), the student researcher and author of this body of work who has extensive experience of qualitative research, conducted all interviews. The interviewer and participants did not know one another; apart from an email to arrange the interview, no previous contact had been made. Interviews with canteen management were pre-planned and conducted after lunch service, mid-afternoon, in a private office and audio recorded.

Interviews with canteen users were ad hoc conducted during the lunch service, when customers had just purchased food and audio recorded. Users were approached after purchasing their food and/or drink items and if agreed to take part, were asked to sit with the interviewer at a spare table and chairs within the public shared space of the canteen. Participants did not receive copies of their interview recording, transcripts, or notes, and did not provide any feedback on the interviews.

The audio recordings were transcribed verbatim and final transcripts were printed. One researcher (SS) read each transcript in the order in which interviews had been conducted. This was thought important, as subtle changes to the interview technique and questioning was made after the first few interviews. For example, more pauses were included as interviews went on allowing for the interviewee to speak, and the order of questions was changed so that they were more conducive to a conversational style if necessary, which made the interviewee more comfortable allowing the interviewer to draw out more detailed explanations. This led to more in depth and valuable data.

Transcripts were read and then re-read to ensure full immersion in the data and any themes emerging were highlighted (Burnard et al., 2008) and assigned a code in the page margin next to the relevant section of the transcript. For example, an interviewee that referred to the time of day best to conduct interventions was noted and in the margin the code ‘intervention timing’ was added.

The codes and themes identified in the transcripts were added to an analysis matrix in an excel worksheet. The matrix consisted of columns to which headings were added using codes from the page margins of the transcripts. Each transcript (interview) was assigned to a row, below which the rows were populated with quotes taken directly from the transcripts.

An independent second reviewer (C'OM) analysed a proportion of the transcripts. The results from each researcher were compared and agreed on then both worked on defining the themes, adding further to the matrix. Once completed, the matrix allowed for comparison over a theme and within a case (interview) identifying any patterns emerging across transcripts and interviews.

The framework analysis not only helped identify the hierarchy of the themes but further helped to summarise the results whilst keeping a link to the original data. Links between the interviews and interviewees with the type of themes emerging were made and helped explain what was happening in the workplace food environment.

Further to the interviews, extensive field notes were taken whilst on-site and after conversations with participants and combined with interview data, observational and checklist data to give a more in-depth account.

4.3 Ethical Approval

All data relating to the study has been treated as confidential and stored securely in accordance with the Data Protection Act 1998. The study was approved by the Research Ethics Sub-Committee within the School of Medicine, Pharmacy and Health at Durham University (ESC2/2017/PP06) (Appendix 24). The qualitative interview section of this study was conducted in line with the COREQ checklist (Tong et al., 2007), see Appendix 25.

4.4 Results

4.4.1 Study Sample

4.4.1.1 Workplace Canteens

Of the eleven Health Leads and Health Advocates contacted, three responded to email contact. One had moved to another job, two responded but did not have a canteen on-site, however they offered to help recruit via contacts in workplaces. They contacted workplaces known to them with a canteen but this was to no avail. Attempts were made to contact workplaces close to mobile caterers on industrial sites that were likely to have a canteen (identified from an online search of the FSA website identifying workplaces with some sort of food catering provision).

Fifteen workplaces were contacted (a combination of email, telephone calls, and post). One workplace was fully recruited to the study via these recruitment methods; data from a second workplace was captured via a 'secret shopper' visit. This was possible as the canteen, which was based at a workplace and used by their workforce, was also open to the general public. Although it was not possible to speak to the staff or users as ethical consent was rejected, the checklist and observations were completed in full.

4.4.1.2 Mobile Caterers

Face-to-face contact was the only contact method that engaged vendors to agree to take part. They did seek clarification that it was not a council visit, or an information gathering task to inform setting up a new mobile catering business. Once the project was explained fully, most vendors were willing to participate in completion of the food checklist there and then. None were willing to consent to a structured, recorded interview attributing this to being too busy.

Of the eleven mobile vendors approached, six took part. Three did not return email contact, two did not return the checklist after face-to-face contact, one mobile caterer that drove between pitches said they were *'on a tight schedule'* so did not have time to participate. Of the six that took part, three

were mobile vans that pitched at the same site each day, two were mobile vans that had static pitches (did not drive away after closing) and one was a mobile catering van that drove between pitches (drive-by).

Food checklist data was collected at the mobile catering pitch, two mobile catering vendors insisted on completing the checklist (self-report) which was verified for accuracy when collected. Although none of the vendors took part in structured recorded interviews, they were happy to converse and answered several of the questions outlined in the interview schedule.

In addition to the mobile caterers, three cafes/restaurants on industrial sites that were located close to the mobile caterers were identified. Attempts to engage with the staff however were unsuccessful therefore the data could only be captured if a 'secret shopper' was conducted at these sites. It was possible to see the food and drinks options, layout of the items and seating whilst in the venue. A menu was collected, and promotional offers, daily specials, foods being purchased by users and consumed by customers were all noted as it was not possible to speak to the staff or users. For clarification, the term 'external caterers' refers to mobile catering vans (static or mobile), and restaurants/cafes in industrial sites.

4.4.2 Outcomes from Onsite Observations

Figures 16-20 are annotated google maps of the locations of the workplace canteens at sites 1 and 2, the mobile vans, cafes/restaurants and other catering outlets in the vicinity. A detailed description of the foods and beverages sold across all sites is available in Appendix 26.

The first workplace, Site 1 was located in close proximity to a number of other food outlets, including another staff canteen open to the public (approx. 10 minute walk), a market town high street (approx. 20 minute walk), a mobile catering van selling jacket potatoes and a retail park with catering establishments (approx. 10 minute drive). This was the larger of the two workplace canteens, which was open to the public. On-site, there was a

canteen and a vending machine in one building, a coffee shop and vending machines in an adjoining building. The canteen was open from 11:00 to 14:00 weekdays and closed on weekends. When the canteen was closed, the vending machines remained accessible. The food provision at this site was from a menu that changed daily, except for the sandwich and salad bar which was replenished daily but with the same options.

Vending machines dispensed high calorie, high fat confectionary or potato chip snacks, and low fat, low sugar versions of soft drinks, and hot drinks such as coffee and hot chocolate. The vending machines were replenished by the on-site catering company, not an external company. Vending machines were in prominent positions where there was good footfall. Figure 21 and 22 are photographs taken of the vending machines and the configuration of items. The canteen could seat 100 plus people, and included large circular tables seating 10 people, with smaller traditional canteen tables and chairs.

The second workplace, Site 2 had a canteen and was based in a workplace selling food and other bulk items for commercial use, also open to the public. Located on an industrial site this workplace was in close proximity to three mobile catering vans, and a restaurant/café that could all realistically only be reached by car (approx. 5 minute drive) due to poor pedestrian access and a dual carriageway running through the site. These mobile caterers were included in this study. A mobile drive-by caterer also visited nearby to this workplace and was again included in this study. Close by was a public house, with the nearest town reached only by car (approx. 15-minute drive). This establishment could seat 30 plus people, and included small leather sofas and armchairs, and more traditional canteen tables and chairs.

The restaurants/cafes and mobile vans were pitched across five industrial sites with some retail outlets in the vicinity, across the Stockton-on-Tees area. One site was situated in an affluent town within the Teesside locality. Within the sites there was a mix of workplaces including office blocks, retail, catering, and large industrial workplaces. The mobile vans were open from

07:00 to 14:00 weekdays, and two opened on Saturday lunchtimes however this was flexible. On weekends the vans sometimes had other private catering events (such as weddings and parties). Restaurants/cafes were open from 07:00 to 15:00 weekdays and either closed on weekends or opened shorter hours (08:00 – 13:00) on Saturdays.

There was alternative food provision in the immediate vicinity of the restaurants/cafes and mobile vans, including independent cafes and franchises, cafes in high street stores, a public house, and other retail outlets that sold pre-packed sandwiches and snacks. There was some seating provided by the vans, consisting of two plastic chairs on the roadside or a picnic bench seating 4 people. There was a range of seating in cafes/restaurants for between 15 and 35 people and included smaller traditional canteen tables and chairs, and occasionally sofas and armchairs.

Figure 16: Location of Workplace 1 and Surrounding Food Environment

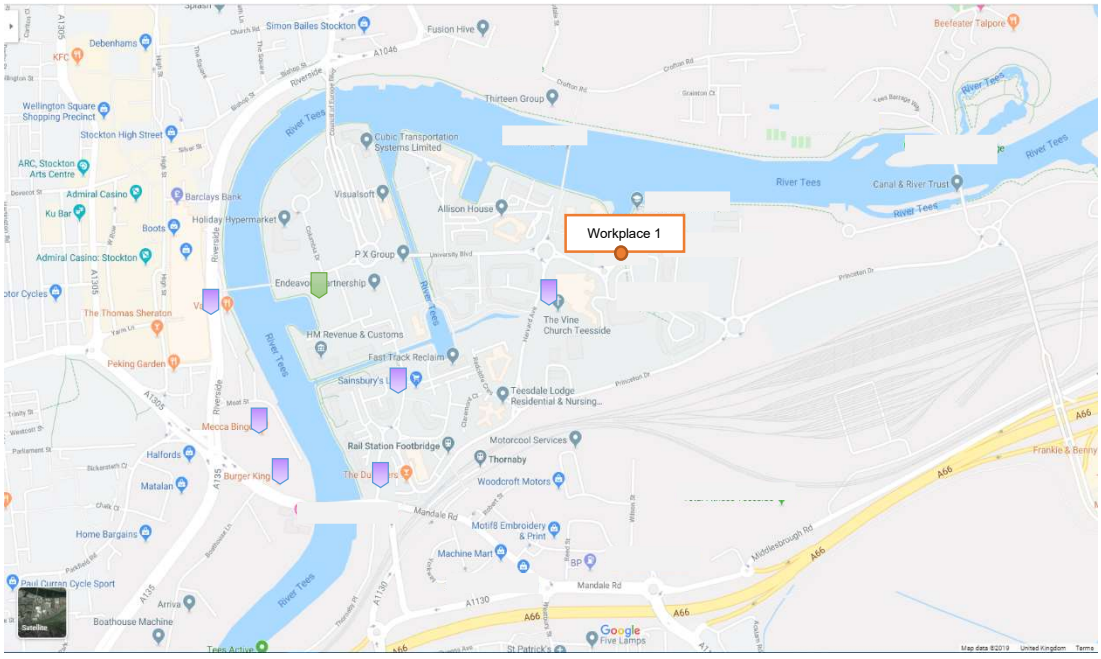
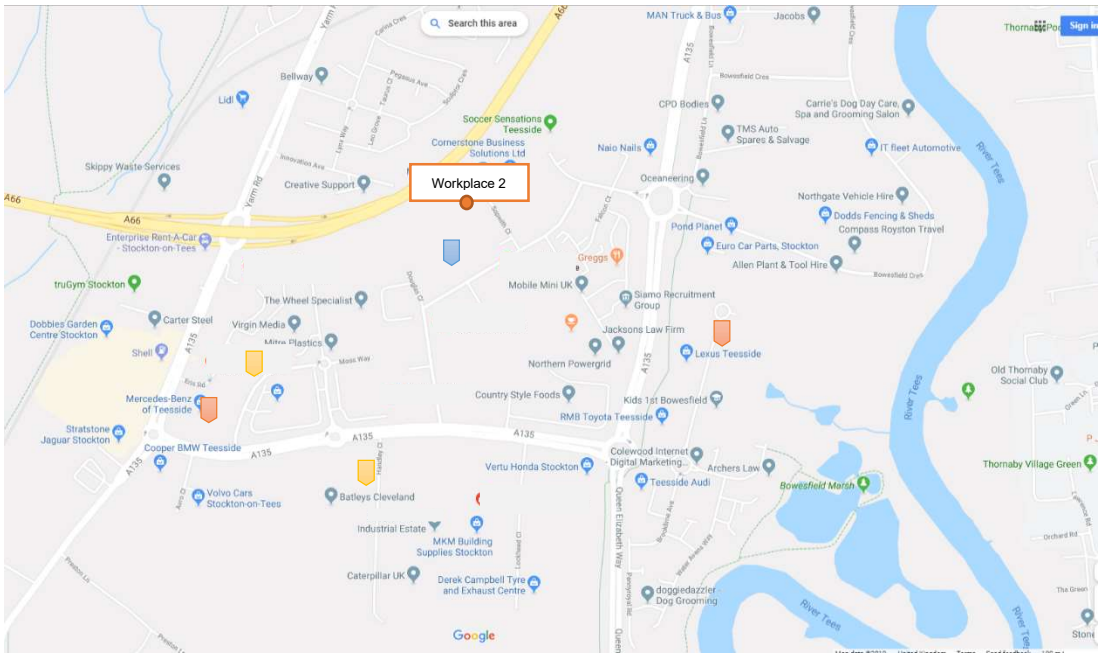
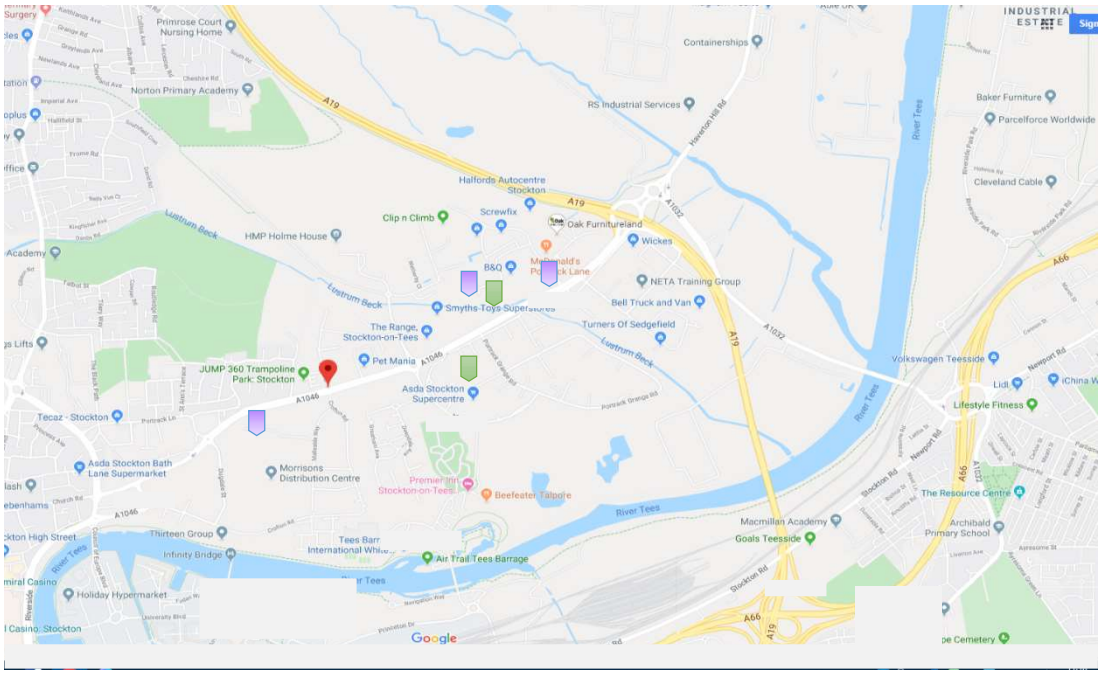


Figure 17: Location of Workplace 2 and Surrounding Food Environment



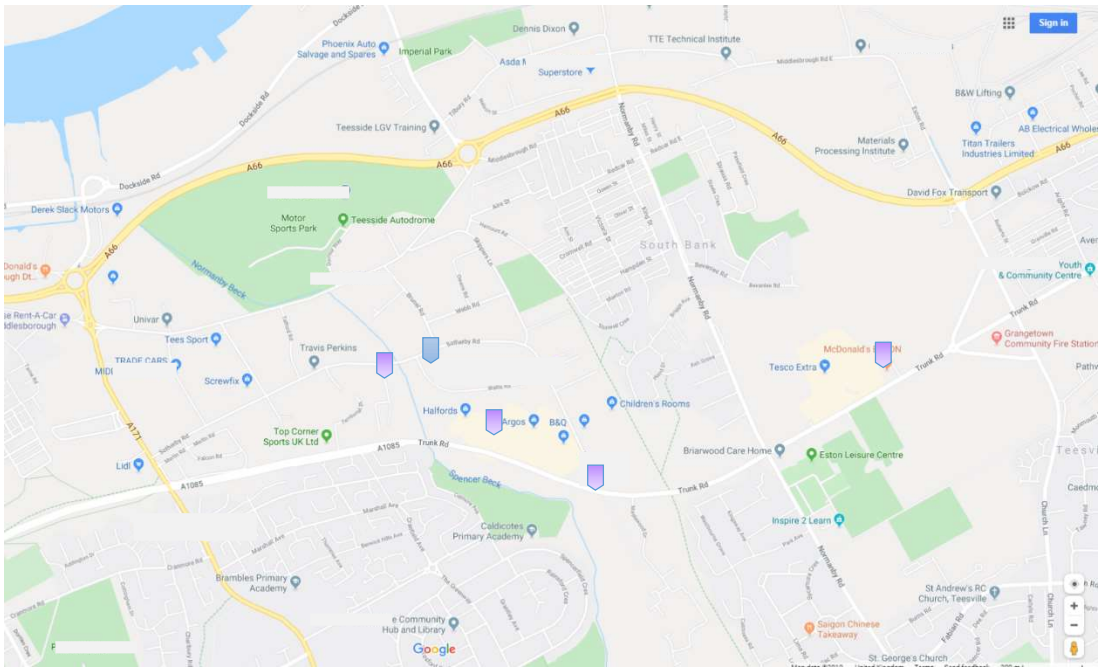
Café/Restaurant in industrial unit
Mobile catering van (mobile, drives between sites, same pitch each day)
Mobile catering van (mobile, same pitch each day)
Mobile catering van (static)
Alternative catering facility

Figure 18: Location of Industrial and Retail Site 3



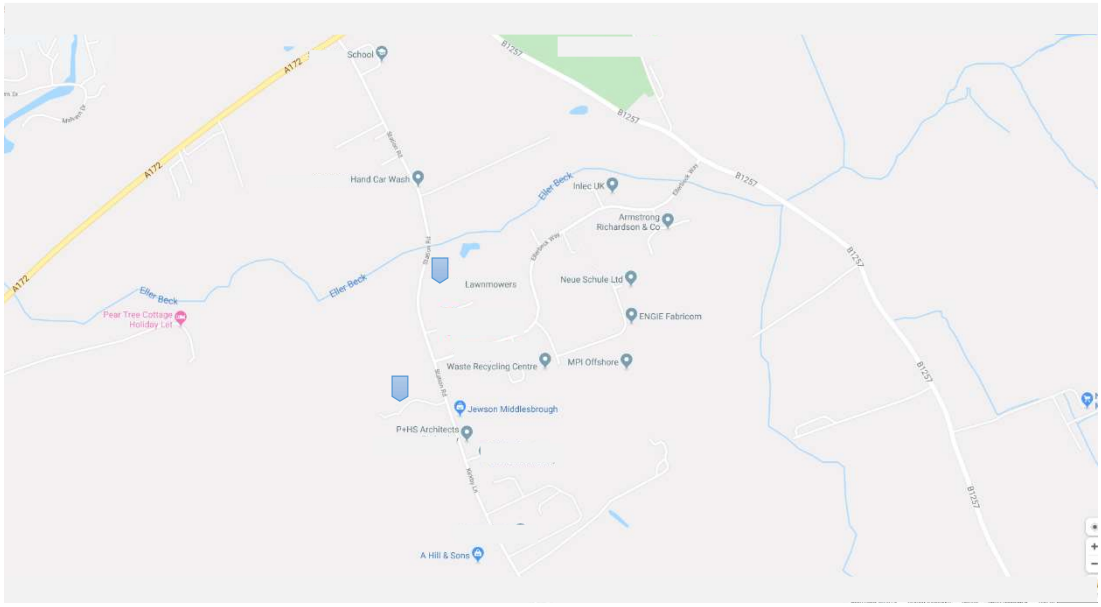
Café/Restaurant in industrial unit
Mobile catering van (mobile, drives between sites, same pitch each day)
Mobile catering van (mobile, same pitch each day)
Mobile catering van (static)
Alternative catering facility

Figure 19: Location of Industrial and Retail Site 4



Café/Restaurant in industrial unit
Mobile catering van (mobile, drives between sites, same pitch each day)
Mobile catering van (mobile, same pitch each day)
Mobile catering van (static)
Alternative catering facility

Figure 20: Location of Industrial and Retail Site 5



Café/Restaurant in industrial unit
Mobile catering van (mobile, drives between sites, same pitch each day)
Mobile catering van (mobile, same pitch each day)
Mobile catering van (static)
Alternative catering facility

Figure 21: Vending Machine Layout in Workplace 1

Figure 22: Vending Machine Food Item Configuration

4.4.2.1 Characteristics of the Workforce

The characteristics of the workforce accessing each catering establishment varied. Both worksite canteens had good footfall from a mix of employees and the public accessed the two workplace canteens, including those from other workplaces in the vicinity.

At workplace canteen site 1 it was predominantly office workers from the business itself that accessed the canteen with the addition of students (aged ≥ 16 years) whose campuses were close by and within walking distance. At workplace canteen site 2, predominantly high visual clothing and manual labourers accessed the canteen, alongside members of the public.

It was observed that a mix of workers accessed the mobile catering vans and cafes/restaurants in industrial units, including workers in high visual clothing, people in suits, and office workers. At the drive-by vans, customers were predominantly car salespersons from nearby garages.

4.4.2.2 Healthier Alternatives Available

A detailed description of the healthier alternatives to foods and beverages on offer is available in Appendix 23 and 26. Below follows a summary of the findings.

4.4.3.2.1 Workplace Canteens

In canteen 1, there was a healthier alternative available to each food item and the healthier alternatives or ‘lighter’ options were cheaper or no extra cost to the customer. There was a stir fry area where customers could pick their vegetables and meat or meat alternative, and freshly prepared vegetables were available as sides alongside potatoes (boiled and jacket), pitta breads, rice and a salad bar. Prepacked and freshly made salads as mains were available. There were various bread options, including wholemeal and seeded and healthier fillings, such as plain tuna as well as tuna mayonnaise, plain cheese as well as cheese savoury.

The salad bar was extensive and included fresh produce that was replenished daily. Fresh fruit was placed prominently in the establishment. Fruit yogurts and plain yoghurts were available.

For hot drinks there were low fat milk and creamer options, and fresh cartons of low-fat milk. There were bottles of low-fat diet drinks and bottled water, with a free water dispenser also. There was low fat, low salt condiments available. There was the option of smaller portion sizes, for soup and for hot drinks.

At canteen 2, there was evidence of low fat, low salt condiments available and sugar alternatives such as sweetener for hot drinks. There was a side salad available but not as a main dish. Soft drinks and water were available to purchase in bottles from fridges, and included diet versions, fruit juice and readymade pre-bottled smoothies. There was the option of smaller portion sizes, for soup and for hot drinks.

4.4.3.2.2 Mobile Vans

Smaller portion sizes were available (two sizes of hot drinks, small and large and smaller portions of chips) and healthier alternative fillings were on offer such plain tuna, and salads without mayonnaise or oil/cream dressings, healthier alternative bread rolls and wraps. Two vans provided main dish salads, and one van provided jacket potatoes, boiled rice, pasta dishes with vegetable sauce, quiche, wraps, and omelette.

Muesli and cereal bars were also provided at two vans next to the confectionary and chocolate. Diet and non-diet carbonated soft drinks including energy drinks were provided, alongside bottled water, cartons of low-fat milk, low or no sugar alternatives. One van offered low sugar fruit juices. Furthermore, other steps were taken in the preparation of food, for example, only buttering buns on request and offering a side salad.

4.4.3.2.3 Drive-by Vans

The drive-by vans had some healthier alternatives, such as providing main dish salads, muesli and cereal bars as alternatives to confectionary, low fat milk and diet soft and carbonated drinks were available.

4.4.3.2.4 Cafes/restaurants in Industrial Sites

There was evidence of healthier alternatives at cafes/restaurants in industrial sites, with all but one providing diet soft and carbonated drinks, and bottled water. Different varieties of bread for sandwiches were available, and a side salad option, jacket potatoes and rice. Two sites offered main dish salads. There was evidence of healthier hot meals, such as a regional dish the 'guilt-free parmo' (see photographs below). These options were selected as they were promoted by the vendors as a healthier alternative (alt) compared to other menu choices.

E **F**

E = Mexican flavoured sliced chicken breast, wholemeal roll (alt), lettuce, tomatoes, carrot, sweetcorn, no spread (alt). One portion size to take away from mobile caterer.

F = 'Guilt free pizza topped chicken' consisting of chicken breast minus breadcrumb (alt), shallow fried (alt), not topped with béchamel sauce (alt) topped with tomatoes (alt), cheese, with a side of rice (alt) and salad (alt). One portion size to eat in at café/restaurant on industrial site.

4.4.3.2.5 Vending Machines

The healthier alternatives in vending machines were for drinks only and included the option to have less or no sugar and milk in hot drinks. All the soft drinks available were low fat and diet varieties.

4.4.3 Onsite Interviews with Food Providers and the Workforce

The interviews attempted to tackle practical issues such as what food provision changes are feasible and acceptable, and how food provision changes may be implemented. Interviews began by covering the respondent's current role with regards to workplace food provision, before narrowing the focus to investigate current practice in their workplace setting in terms of implementing dietary change within the workforce.

Detailed field notes were taken of the interview itself (suitability of the questions, what new questions would be useful, what information was hard to gain, limitations to the data of the interview questions) as well as notes on observations of the interviewee and both the food and non-food workplace environment. These field notes are included in the results and discussion to help explain what has been learnt by the interview process, as well as the findings from the actual content, and helps to inform future action.

4.4.3.1 Interviews with Canteen Management

Two members of managerial staff at Workplace Site 1 took part in a short, semi-structured recorded interview. The manager of the canteen and the assistant manager took part in the interviews. As there were too few interviews to conduct a robust thematic analysis, the data has been pooled and summarised here.

The interviewees' roles were to oversee the day-to-day running of the canteen and were in charge of the staff rota. They both provided details of the food and drink options available at the site, including the canteen and vending machines, and confirmed the items identified in the food environment checklist. The responsibility of selecting food available on site

fell solely to the management of the company that they were employed by, who also made decisions on the items replenished in the vending machines. However, the canteen manager did feed back to the overall management of the company details on bestsellers.

'that would be the [company name], ye[s] the management, they decide what is supplied and sold, we provide them with feedback on what sells well and what doesn't, but they [the company management] decide what'
(Canteen Manager)

The canteen manager was, in discussion with the company management, responsible for the layout of the items in the canteen. The overall structure was already in place and therefore dictated the placement of items but there was some that was the decision of the management, such as the placement of the high calorie snacks by the self-serve drinks station, and the fresh fruit and snacks display by the entrance.

'that was a decision made jointly by me [canteen manager] and the [company name] management, we had some input there'
(Canteen Manager)

The bestselling food items were identified as those sold at the deli-counter which housed the salad bar and included the freshly made sandwiches, jacket potatoes, and also the hot food options were popular amongst the younger canteen users and students. In particular the foods that were traditional British classics, and the international specials, such as fajitas and stir-fry. The bestselling drinks were the coffee, which was either freshly brewed or from the self-serve coffee station, and the soft drinks from the refrigerator. The low fat, low sugar or zero sugar soft drinks were equally if not more popular.

'the coffee, and the soft drinks from the fridges, they are always popular, both the full and zero sugar ones'
(Canteen Assistant Manager)

'the hot food station, with the fajitas and the stir-fries, they always go down well, and the students tend to like those'
(Canteen Manager)

There was a range of people accessing the canteen, from the workers onsite employed by the same company, to students who were studying at the site. Workers and students from other workplaces and a nearby college in close proximity (5-10 minute walk) also frequented the canteen. Members of the public, including a local cycling club, regularly stopped for coffee and a snack at the catering facilities on site. The canteen was well attended by the workers onsite.

'we have different people really, there's the staff and the students, but we are open to the public too, and we get people coming in for coffee, snacks, food'
(Canteen Assistant Manager)

The canteen was not a member of a healthier workplace initiative but they did have awards for hygiene.

There were some healthier options described for food items, such as the salad bar, fruit, yogurt pots, wraps (for sandwiches) and cereal bars on sale. Healthier options for the drinks included the low fat, low sugar soft drinks. It was felt that there had always been healthier options provided, but that there had been more emphasis on providing more healthier alternatives over the years, and that this had been welcomed by the canteen users. There had been the introduction of more hot dishes with rice, and the salad bar, which proved popular amongst canteen users and was identified as the source of some of the bestselling options. It was not clear whether implementation of healthier options was due to consumer demand or simply a managerial decision.

'We've always had healthy food but there has been more introduced over the years, the salad bar and the hot meals in particular, they have been popular,
(Canteen Manager)

As a result of the increase in choice of healthier options preceding the interview, there was nothing further that was thought to be needed in terms of changes to food provision or promoting healthy eating. There was a confidence that the workers welcomed these changes when they were implemented and that there were no barriers to implementing the changes at the time, nor any negative impact afterwards, for example, on footfall.

'People keep coming, they kept coming and they seem to be happy with what's on offer'

(Canteen Assistant Manager)

4.4.3.2 Interviews with Canteen Users

Five canteen users took part in a brief interview which aimed to gather information of awareness of healthy options in the canteen, how they identify healthier options, whether they are interested in healthier options, and what changes, if any, they feel are desirable, acceptable and affordable to themselves and other users of the canteen facilities. Two further canteen users expressed an interest in taking part but subsequently were not available for interview.

There were five overarching themes that emerged from the thematic analysis: 1) Determinants of where the workforce purchase food; 2) Determinants of food choices amongst the workforce; 3) The impact of change to onsite workplace catering; 4) Lack of availability of and access to healthier options; 5) Limitations on staff taking a lunch break.

Theme 1: Determinants of where the workforce purchase food

The main reasons interviewees used the canteen were convenience, to meet and socialise with other colleagues, and because there was limited choice near the worksite. The canteen users were aware of other catering establishments in the vicinity but preferred the close proximity of the canteen.

It was indicated that colleagues did frequent external outlets but interestingly to take physical activity, not because they preferred the food elsewhere.

'Convenience, it's within walking distance, and I'm too lazy to make a packed lunch'
(Canteen User 1)

'Convenience, there's nothing else in the area really'
(Canteen user 3)

'(my colleagues) like to walk, the exercise, whereas I'm a lazy thing and come to the closest point'
(Canteen User 1)

Theme 2: Determinants of food choice amongst the workforce

The availability of foods, personal food preferences and food pricing were the main drivers in food chosen and purchased amongst canteen users. They tended to purchase what they liked, and of course what was provided, and were less influenced by food packaging or presentation. The preferred food and beverages from the canteen were jacket potatoes with a filling and salad, or a sandwich from the sandwich bar, not prepacked, with a cup of coffee or tea to take away. An increase in pricing had an impact on food choices, prompting them to select a cheaper option.

'The food prices have gone up considerably!'
(Canteen User 4)

'I always consider healthy options, but its health and cost, cost has an impact…. that's £30 a week, it didn't used to be like that'
(Canteen User 2)

'I like this [food], I don't look at the packaging really'
(Canteen User 3)

'well it's what they [canteen] decided to offer I suppose, but I wouldn't buy it if I didn't like it'

(Canteen User 5)

Theme 3: The impact of change to onsite workplace catering on the workforce

As one canteen user had been employed for eighteen years at the site, he had seen changes in the catering style and pricing, which was mainly attributed to a new catering company taking over in recent years. The old catering company were favoured by the canteen user as they had a better selection of hot meals but had been made redundant.

'(the workplace) used to have its own catering department that did all the cooking in house, they were made redundant'

(Canteen User 1)

Theme 4: Lack of availability of and access to healthier options

The canteen users thought that the choice of foods on offer was *'good'* and that the quality of the items '*had improved'* however there was some criticism of the lack of choice when it comes to healthier options. Canteen users expressed a consciousness of making healthier food choices but thought that there was a lack of hot food healthier options at the canteen. They said they would be inclined to purchase a healthier alternative, price depending, if it was made available as they had done so in the past.

'Hot food could be healthier, a hot food option which is mid-priced, as I'm using (the canteen) everyday I'm conscious of the cost'

(Canteen User 2)

'I preferred rice to chips'

(Canteen User 5)

Theme 5: Limitations on staff taking a lunch break

Workload would influence whether canteen users took a lunch break or not, clarifying that too much work meant they would miss lunch. To most, lunch was quick and not an opportunity to sit down to eat a meal at a leisurely pace.

'I go to the nearest place for a quick refuel'
(Canteen User 1)

'time, it's nearest, and I can grab something quickly to eat at my desk'
(Canteen User 4)

Although short, the interviews revealed the canteen users' choices and preferences, and what factors influenced their food selection, such as cost and availability of food items, and location of the canteen versus external outlets. The interview provided information on types of foods available to the workforce and what changes to the canteen provision was feasible and acceptable to them, that they would likely engage with if implemented.

4.4.3.3 Observations and Unstructured Interviews with Mobile Vendors

Although none of the mobile catering vendors consented to take part in structured recorded interviews, they were happy to engage in conversation and answered several of the questions outlined in the interview schedule that were put to them i.e. identifying bestsellers, who purchases food from them, barriers to offering healthier alternatives, demand for healthier alternatives.

The results that follow are from field notes taken immediately after the observations and discussions with mobile catering vendors. Neither written nor verbal consent was taken from the vendors; therefore each vendor was provided with an information sheet and was notified that they can contact the researcher with any queries or to take part in a more 'formal' interview.

There were four overarching themes that emerged from the observations and discussions with vendors: 1) Relationship with loyal customers; 2) The

impact of changes to workplace catering on vendors and the workforce; 3) Demand for healthier options in mobile catering; 4) Convenience.

Theme 1: Relationship with loyal customers

The mobile vendors were experienced in mobile catering and typically the owner of the business. They are aware that there is a perception and assumption that mobile catering provides only unhealthy food. There was clearly a good relationship between mobile vendors and their customers, who had regulars and were on first name terms. One vendor was affectionately called ‘Gran’ by customers because she had regular customers that had visited her mobile van for many years.

Theme 2: The impact of change to onsite workplace catering

The mobile vendors provided a unique insight into the work environment in which they were trading and were able to explain how workplaces nearby had been closing down and also that there had been changes in shift patterns in industries in close proximity to them. Workers from these industrial workplaces would purchase from the vans in the past, however the changes saw shifts starting at 2pm when most workers have had lunch before then, and mobile catering vans tended to close at 2pm. This has directly contributed to a decline in footfall at the vans. Coupled with the closure of workplaces, even fewer employees are in their immediate vicinity. Overall mobile vendors felt that people were spending less on food for lunch and were cutting back on food in general.

One workplace in the vicinity closed the onsite canteen and tried to make a deal with a mobile caterer that pitched on site to offer healthier options and pay more rent to pitch on-site. The increase in rent was from £30 to £100 a week. This offer was declined by the mobile vendor and consequently they moved pitch and lost custom from the worksite.

Theme 3: Demand for healthier options in mobile catering

There was conflicting evidence with regards to the provision of healthier alternatives at mobile vans. In some instances, vendors spoke of little demand for healthier alternatives and customers accessing the mobile vans declined healthier alternatives when they were provided. For example, one vendor offered brown bread and another salad, but they found few customers opted for these. However, one vendor spoke of her female customers who telephoned her to place a bulk order for their work team to collect. Interestingly, this mobile vendor was female and was the only vendor to have female customers. She had found that women working in offices close by who were dieting would request diet friendly options from her. A mutually beneficial arrangement.

The location of the vans to the workplaces was convenient to workers, and the vans providing a delivery/pick up service to offices was popular. Mobile vendors catered for individual needs and made amendments to their food provision if customers specifically requested items, such as pastas and vegetable sauce, or quiche which were not listed on their 'usual' menu.

4.4.4 Choice Architecture

Choice Architecture is 'the idea that behaviour can be influenced at population level by altering the environments within which people make choices' (Hollands et al., 2013, p1). Using the Hollands paper (2017) which was utilised alongside the CALO-RE taxonomy in Chapter 2, an attempt was made to identify the choice architecture interventions from on-site observations.

The CAIs identified in workplace canteens, mobile vans and restaurants/cafes in industrial sites are available in detail in Appendix 27. Tables 12 and 13 summarise the frequency of CAIs across all study sites. In addition, Figures 23 and 24 are photographs taken of the canteen layout in both workplaces to demonstrate how the CAIs were identified. No photographs were able to be taken of the mobile vans or other external food outlets.

Figure 23: Workplace Site 1 Canteen Configuration

A B

C D

These images above are snapshots of the canteen configuration. This canteen was the larger of the two so several images were required. The images are displayed in turn from a user's journey through the canteen, starting at the entrance (A) then to (B), (C), and finally (D) which captures items positioned in close proximity to the checkout. We had full disclosure to take these images.

Figure 24: Workplace Site 2 Canteen Configuration

This image is a snapshot of the canteen configuration. The canteen user would queue on the right-hand side of the image and move from right to left of the image. As this canteen was smaller in size it was possible to take a broader shot of the catering configuration, but it was not possible to take close up, more detailed images due to the 'secret shopper' data collection method. Any identifiable features or branding are disguised to ensure anonymity.

Table 12: Choice Architecture Interventions (CAI) and Frequency of Use across all Catering Establishments

Choice Architecture Intervention (CAI)	Total catering establishments (n=4) using CAI n (%)	
41 Ambience	4	(100)
42 Functional Design	4	(100)
43 Labelling	4	(100)
46 Availability	4	(100)
47 Proximity	4	(100)
48 Priming	4	(100)
49 Prompting	4	(100)
45 Sizing	4	(100)
44 Presentation	2	(25)

Table 13: Choice Architecture Interventions (CAI) and Frequency of Use in each Catering Establishments

Canteen 1		Canteen 2		Mobile Vans		Restaurants/cafes in industrial sites	
CAI	n (%)	CAI	n (%)	CAI	n (%)	CAI	**n (%)**
Proximity	6 (26)	Proximity	4 (25)	Proximity	8 (36)	Proximity	5 (25)
Availability	4 (18)	Prompting	3 (19)	Functional Design	5 (22)	Prompting	3 (15)
Prompting	3 (13)	Priming	3 (19)	Availability	3 (14)	Functional Design	3 (15)
Presentation	2 (9)	Availability	2 (13)	Prompting	2 (9)	Priming	3 (15)
Labelling	2 (9)	Labelling	1 (6)	Labelling	1 (5)	Availability	2 (10)
Functional Design	2 (9)	Functional Design	1 (6)	Priming	1 (5)	Ambience	2 (10)
Ambience	2 (9)	Ambience	1 (6)	Ambience	1 (5)	Labelling	1 (5)
Sizing	1 (4)	Sizing	1 (6)	Sizing	1 (5)	Sizing	1 (5)
Priming	1 (4)	Presentation	0 (0)	Presentation	0 (0)	Presentation	0 (0)
Total	23 (100)	Total	16 (100)	Total	22 (100)	Total	20 (100)

4.4.4.1 Choice Architecture Interventions (CAIs) Identified

The site with the most CAIs coded was canteen 1 (23), followed closely by mobile vans (22), restaurants/cafes in industrial sites (20), and finally canteen 2 (16).

All nine CAIs were used in canteen 1, the rest of the sites used eight of the nine CAIs. Canteen 1 was the only site to have used presentation (fruit in attractive greengrocer style basket; yogurt pots with granola). The three most frequently coded CAIs: in canteen 1 were Proximity (6), Availability (4) and Prompting (3); in canteen 2 were Proximity (4), Prompting and Priming (3), Availability (2); in mobile vans were Proximity (8), Functional Design (5), and Availability (3); and in cafes/restaurants in industrial units were Proximity (5), Prompting and Functional Design and Priming (3), and Availability (2).

Across all sites the most frequently coded CAI was proximity, which are 'techniques to make behavioural options easier (or harder) to engage with, requiring reduced effort'. Proximity was particularly high for mobile vans (8), this could be explained by two things: firstly the vans are smaller in size compared to canteens and cafes so the items on offer are closer because there is less space, and secondly and more importantly, items (such as confectionary and snack items) were placed in closer proximity to the hatch and within the customer's eye line, much the same as these items are arranged in canteens and cafes, at eyelevel and close to the checkout.

In addition to proximity, availability and prompting were coded frequently across all sites. There was more availability coded in canteen 1 (4) than other sites, but closely followed by mobile vans (3). This suggests that these sites had the greatest choice of food items on offer. This is supported by the checklist data showing a comprehensive choice of items available at the canteen and mobile vans.

However, what sets these sites apart is that canteen 1 was the largest of the sites studied, and mobile vans do not have the same capacity (for cooking and food provision) that the canteen has. This demonstrates that despite

these physical limitations, mobile vans were providing a broad choice of food and drink items. Furthermore, this finding suggests that there is wide variability in availability, therefore choice of foods across workplace canteens.

Sizing was consistently across all sites only coded once, this related to smaller portion sizes. Labelling and Ambience as interventions were also less frequently coded. The only instance of labelling in mobile vans and restaurant/cafes in industrial sites was on the soft drinks and confectionary. There was more evidence of labelling in canteens as they sold pre-packed items such as sandwiches. Instances of Ambience were posters and prints depicting food that were displayed in the food establishment.

4.5 Discussion

4.5.1 Food Available to the Workforce

As previously identified in Chapter 3, whilst at work the workforce access food from workplace canteens and vending machines (sometimes one or neither was available), plus mobile vans that drive up to and pitch onsite at workplaces (the van man). In the absence of onsite canteens, the van man was the main food provider onsite. There was a need to gather data on what food is available to the workforce to better understand the workplace food environment.

This study has identified that in the wider food environment, there are mobile vans (static) and cafes/restaurants that are situated in industrial units on industrial estates as other means of food provision to the workforce. There are also sandwich shops, public houses, independent cafes and coffee shops, supermarkets, fast food outlets (i.e. fish and chip shops), fast food drivethru's, takeaways, and food delivery (Deliveroo, JustEat etc.) that are used by the workforce to obtain food whilst at work.

Most of the food outlets and catering is available to the workforce during daytime hours. The data collection window was between the hours of 11:00 – 14:00, however the interview, discussion and observational data captured that these providers opened early morning for breakfast, then reopened mid-morning until 1pm or 2pm for lunch provision. It appears that there is limited (if any) food provision outside of the usual Monday to Friday, daytime (09:00 to 17:00) hours, for example shift work, weekends and evenings, usually when the workforce relies heavily on food delivery.

There was a variety of foods available to the workforce. At each catering establishment there was a choice of fried, non-fried, and baked goods, some freshly prepared, and others pre-prepared and re-heated, or prepacked.
It was observed that the canteens provided more baked and non-fried goods, mobile vans (static) and cafes/restaurants in industrial units provided a greater proportion of fried to non-fried goods. The drive-by vans had no cooking facilities so provided pre-baked packaged items. All sites provided high calorie/sugar/salt snacks and confectionary, full fat and diet drinks, and hot beverages (tea, coffee, hot chocolate). Fresh fruit and vegetables were provided at the canteens and some cafes/restaurants, but not at mobile vans. Canteens and drive-by vans had a higher proportion of pre-packed sandwiches, whereas the other providers tended to prepare food on premises, often to order. Bestsellers at mobile vans were burgers, hot sandwiches (white bread bun, bacon, sausages), meat pies and salad boxes; all-day breakfasts, jacket potatoes, sandwiches (optional brown bread) at restaurants/cafes; at canteens bestsellers were freshly made sandwiches, jacket potatoes, and also the hot food options in particular traditional British classics.

Across all sites there was evidence of healthier alternatives, more so in canteens and some cafes/restaurants than in mobile vans. Healthier alternatives had been successfully implemented in both workplace canteens, and some cafes/restaurants in industrial sites. This finding is in line with other evidence of mobile catering that has showed 72% of vendors audited in

one US study offered at least one healthy menu item, however overall, the proportion of menu items classified as healthy was low (Reznar et al., 2019).

It appears that the interest and demand for healthier alternatives was higher at workplace canteens, as evidenced by the number of options available on the menus and observing large numbers of customers purchasing these options. From the interview data with canteen management and users, the healthier options had proved to be some of the canteen's bestsellers and users at least were open to accessing healthier alternatives in the canteen if they were to be available. The demand for healthier alternatives amongst customers accessing the mobile vans was mixed. In some instances, vendors reported customers declined healthier alternatives when they were provided, such as brown bread and salads, and in others there had been changes in food preparation, only buttering bread on request for example, and making omelettes, using wraps instead of bread, in response to customers' demands for healthier alternatives, from particularly female customers. Mobile vendors tended to provide healthier options on request, on a supply and demand basis to keep waste and financial loss to a minimum.

These findings are similar to those of a recently conducted audit of mobile food vendors in Michigan, US (Reznar et al., 2019) in which results showed that the majority of vendors had positive views about healthy menu items and felt they could be incorporated, but customers' preferences and value were the most important factors as to whether a menu choice was successful or not. The authors reported that the biggest barrier to uptake of healthier alternatives was low consumer demand and hence so few vendors put healthy items on the menu. These findings suggest that mobile catering vendors are potentially a key role in shaping future interventions aimed at targeting dietary intake of populations.

The interviews with canteen users helped to identify that those who have easy access to a workplace canteen that offers a good choice of foods, both hot and cold meals, and with healthier options, may well choose to access

external caterers. The main reason attributed in this case was to take part in exercise in the form of a short walk, not because there was a lack of food on offer as first identified in the qualitative study.

4.5.2 Factors Influencing Workforce Food Choices

This study's findings suggest that there are several factors that appear to influence the workforce when making decisions around food choices during work time. The main factors influencing the types of food chosen and where food is accessed are discussed below:

4.5.3 Food Availability and Limited Alternative Choices Nearby

The workforce can only purchase the foods that are available to them, and although the availability of foods (choice) overall was plentiful across sites, food quality varied. The canteen users thought that the choice of foods on offer was 'good' and that the quality of the items 'had improved' however they expressed a desire for more healthier alternatives, which is interesting because Canteen 1 had the widest choice of foods and healthier alternatives compared to the other sites. At sites where there was less availability (choice) this also meant the choice of healthier alternatives has reduced. Availability of healthy foods in workplace canteens has been identified in the literature as a major factor for promoting healthy eating and the unavailability of healthy options a major barrier (Tamrakar et al., 2020). Of interest, some mobile vans had the second greatest choice of foods, demonstrating that despite some space limitations, that mobile vans can and indeed do offer a broad choice of items, and healthier alternatives, a finding attributed to the workforce specifically asking for these alternatives. Furthermore, the data suggests that there is variability in foods to choose from across workplace canteens.

Based on the limited food preparation data available, it is possible to ascertain that the nutritional quality of the food available at canteen 1 far outweighed that at mobile vans and cafes/restaurants in industrial sites, with exceptions. There were two mobile vans and a café/restaurant that provided

more baked goods to fried goods, but the majority of meals at the mobile vans and cafes/ restaurants were fried, high calorie items.

4.5.4 Convenience

The location of the mobile catering vans and the cafes/restaurants in industrial units was convenient for workers, both those in the vicinity and those passing by whilst travelling between locations. The delivery/pick up service for customers also proved convenient and popular amongst local workplaces. Furthermore, mobile vendors catering for individual preferences from customers proved popular, and a factor contributing to regulars returning to the same vendors. The location of the mobile vans was convenient to the workforce for two reasons: firstly the vans are close to their place of work, only a short stroll away, and on a side road which can be easily accessed with free street parking; secondly mobile vans are convenient as they are often the only food provision in close enough proximity that can be ‘taken away’ and eaten in vehicles or after returning to offices. It saves the worker time to access the mobile vans versus ordering food in a café, bar, public house or in a shop demonstrating much like the canteen users, lunch breaks are a quick turnaround.

Mobile vendors tailoring the food provision was convenient for customers, and perhaps this contributed to customers’ loyalty. This seems a mutually beneficial relationship between customer and vendor, with vendors providing custom orders and customers returning regularly, proof of an effective business model. The pre-order and collect ‘service’ seems to be effective for both parties also, as mobile vendors know what stock to purchase and that they only need buy what they are going to sell, minimising waste and financial loss.

4.5.5 Food Pricing

There was evidence that the availability and pricing of foods in the canteen heavily influenced users’ choices. Increases in pricing, often resulted in canteen users making alternative choices. They felt conflicted between what

is ‘healthier’ and what is ‘affordable’. A reduction in the choice of healthier alternatives and an increase in pricing seriously impacts on the food choices made. Existing evidence suggests that alongside individual preferences, the higher cost of healthy foods in workplace canteens is a barrier to uptake of healthy options (Tamrakar et al., 2020). One study conducted in North Carolina, US (Leone et al., 2019; Ylitalo et al., 2019) surveyed customers who accessed a mobile fruit and vegetable van with results showing that cost was the most common barrier to healthy eating amongst participants followed by lack of transportation for goods home.

4.5.6 Austerity

As identified in Chapter 3, austerity has led to workplace canteens being closed and the workforce are relying heavily on alternative food providers, such as mobile vans, and as identified in this study, cafes/restaurants in industrial units, and takeaways. Austerity has been further identified in this chapter, that in addition to canteen closures, whole workplaces and businesses have closed, or at the very least changes in shift patterns have been implemented. Mobile vendors identified that people are cutting back in general, and that they have seen a decrease in footfall in recent months. A reduction in availability of work shifts, job losses and fear of redundancy could be contributing factors to what food the workforce are willing and able to buy. Canteens, mobile vans and other workplace food providers may be making cuts in terms of the availability and quality of what they offer, making available what they will sell for instance.

4.5.7 Changes to Workplace On-site Catering Provision

One finding that is not underestimated, is the impact of changes to onsite catering on the workforce. The introduction of a new catering company has seen overall availability and choice of foods reduced, but an increase in pricing (see section above regarding availability). The mobile vendors had an in-depth knowledge of surrounding workplaces and their day-to-day management, from catering provision to shift patterns. The close relationship

with customers ensured vendors were kept up to date on the latest closures and were able to adjust and adapt to these changes, ensuring they stayed in business. Importantly this insight from vendors highlights the impact that changes to workplace catering provision (canteens and management) can have on individual workers' food choices and eating patterns.

4.5.8 Workplace Culture and Lunch'time'

Canteen users identified that workplace culture is directly impacting on them, describing how they are experiencing conflict of taking a lunch break when their workload increases, describing their lunch break as 'a quick refuel' and this was not due to personal choice. Other canteen users that were approached were not willing to take part in interviews, stating they did not have enough time during their lunchbreak to take part. Strikingly similar observations have been made amongst rural-based working men in a study to gather their perspectives on food. The men referred to food as 'quick filling fuels' both at work and home and furthermore this was because of time constraints on lunchbreaks (Oliffe et al., 2017). Those that took part in the interviews further highlighted that they do not feel they have the time to take a lunch break so off the worksite is simply not an option, they therefore use the facilities that are closest, the canteen.

Lack of uptake to interviews was not limited to canteen users. No users of mobile vans or café/restaurants in industrial sites who were approached felt able to participate in a short interview due to time constraints. These findings reiterate themes identified in Chapter 3 of the confliction felt by employees, which was in large part due to management not encouraging employees to take an adequate lunch break. This further highlights the need for workplace management to be aware of the mutual benefits of investing in the workforces' health in terms of increased productivity, a reduction in absenteeism and presenteeism.

4.5.9 The Role of Vendors, Workplace and Canteen Management in Food Provision

It seems that there are two distinct management roles in food provision in workplaces: that of workplace management and that of canteen management. As identified in Chapter 3 and further identified in this chapter, workplace canteens are commonly operated by external catering companies. Workplace management's role is simply to choose a company to take on the food provision in its entirety. One can guess that the company chosen is likely to be the most appealing to workplace management in terms of affordability e.g. costs the company the least.

From the interviews conducted as part of this study, it is becoming clear that canteen management have a greater influence on food provision for the workforce. Canteen management influence food availability, food quality and food pricing and were responsible for the layout of the items in the canteen: of note the placement of the high calorie snacks by the self-serve drinks station, and the fresh fruit and snacks display by the entrance were the canteen manager's decision. Evidence exists to show that alongside availability of healthy options, another major factor for promoting healthy eating in workplace canteens was a commitment to promote healthy eating by canteen management (Tamrakar et al., 2020; Price et al., 2016). Of course, the food provision at mobile vans and cafes/restaurants is the sole responsibility of the owner or vendor, usually both. They made the decisions on what foods to purchase, prepare, and provide.

Interestingly and surprisingly, the canteen users offered an insight into the impact of a change in canteen management, mainly a reduction in healthier hot food alternatives and an increase in pricing, which can impact on the individual's food choices, as evidenced here. Interestingly, there is evidence to show that in public sector workplaces there is a feeling amongst canteen managers of having to run the canteen like a business rather than promoting health (Pridgeon and Whitehead., 2012) which shows how crucial it is to engage workplace management and altering the workplace culture

surrounding workplace canteens, lunchbreaks and supporting healthier eating behaviours as well as staff wellbeing.

4.5.10 Identifying Changes to Food Provision to Facilitate Uptake of Healthier Alternatives

The canteen manager, with input from the catering company management, was responsible for product placement in canteen 1. Despite coming from only one canteen, the data gathered helped to identify a number of choice architecture techniques that can be used in food establishments to help customers identify and promote healthier alternatives.

The placement of products in a prominent position is a successful way to encourage sales of items, including healthier alternatives. For example, placing fruit at the entrance to the canteen, vegetables next to the other side options at the main meals counter, low sugar and salt condiments next to the originals, diet drinks next to full fat and sugar varieties in fridges. This technique is applicable for less healthier items such as high calorie snack items in close proximity to the tea and coffee facilities to prompt a sale. The hot drinks stations seem to be a micro-environment within a micro-environment with CAIs clustered in this area. Evidence from a recent systematic review showed that altering the positioning of foods could influence individuals' behaviour and nudge them towards picking a healthier option when available (Hollands et al., 2019) however the evidence is limited and of varying quality, thus requiring further development. The way in which food is presented, either plated or in attractive packaging (for example, hot meals versus packaged sandwiches, yogurt pots versus snack bars/cakes/muffins) can encourage people to make healthier choices but is an underused technique, only evidenced in this study in canteen 1.

Simply having a wider variety and availability of foods allows the customer to make healthier choices (Hollands et al., 2019; Tamraker et al., 2020). Those establishments that offered the most choice offered the most alternatives.

They of course had the means to do so, with the available space and on-site catering facilities playing a major part in what can be provided.

Being offered a smaller portion size is an effective alternative for customers who seem to be aware that smaller portions are often healthier in terms of overall calorie, fat, sugar and salt intake. Reduction in portion sizes has been shown to be effective in reducing energy purchased and consumed (Hollands et al., 2015; Hollands et al., 2018). If the prices are adjusted accordingly to reflect the smaller portion size, this is an effective and efficient way for customers to make healthier choices and is something that all establishments can implement easily.

Food labelling on packaging is also a method in which customers can identify the healthier options and make an informed choice (Crockett et al., 2018) but this is not consistently an option in canteens and even less common at cafes/restaurants in industrial units or mobile vans. A traffic light labelling system of food products in an Asian workplace canteen has shown favourable effects in increasing uptake of healthier options when available and was deemed acceptable by both canteen staff and the workforce (Chen et al., 2017). Similarly, data from samples of the UK and German workforces shows that food labelling is important to them and that workers appreciate transparency about what is in the food they are purchasing from the workplace canteen (Price et al., 2016). Importantly, the long-term effects of introducing food labelling in workplace canteens has been shown to be up to 2 years (Montagni et al., 2020). Food labelling of packages does not seem to be a feasible change for most mobile vans and cafes/restaurants in industrial sites, simply because they make up the majority of their meals on site using undetermined quantities of ingredients and change their menu on an almost daily basis. Menu calorie labelling may be an option but only if recipes are written and adhered to.

Interview data indicated that healthier ‘hot meal’ alternatives are missed by the canteen users. This is perhaps one way this canteen could introduce healthier alternatives, that canteen users have directly expressed an interest

in purchasing. This suggests that involving customers (the workforce) in decisions about food availability and choice in canteens helps to identify what changes they would welcome and engage with, thus being mutually beneficial to the workforce and management.

There are factors that would limit changes being implemented elsewhere in sites other than the canteen setup. Mobile catering has the limitation of lack of space and cooking facilities that canteens and cafes/restaurants have. Drive-by vans have no on-board cooking or preparation facilities.

4.6 The Effectiveness of the Data Collection Methods Used

4.6.1 The Food Environment Checklist

Overall the Food Environment Checklist was useful and easy to use in the on-site observations. It proved effective at gathering detailed information on what food was available to the workforce and highlighting trends in food provision within and between establishments.

One of its strengths was it was able to be used for data collection at all sites, which meant that the data was consistent and thus able to be compared. As well as the researchers, the checklist was easily completed by mobile vendors themselves, however they did comment that the checklist was leaning towards gathering information on healthier options, rather than simply what was on offer. The checklist was not designed for use as a self-report tool, but as some mobile caterers were only willing to take part if they could self-report, perhaps the tool needs adapting for this purpose.

4.6.2 The Interview Topic Guide

The interview with canteen users was designed to be short so as not to impact on the employees break time but was perhaps too short to delve deeper into the factors that impact on an individuals' choice to access mobile catering or other external food outlets in the vicinity. It was a difficult balance to make.

The interviews lacked questioning on other sources of food and beverages available on site, such as the vending machines and café. However, the data gathered was useful despite this, and highlighted areas that warrant consideration for future investigation. For example, the use of a survey distributed to the staff via email may be more effective at gathering information about employees' food choices and would perhaps not add to feeling conflicted taking time away from their desks to take part.

It is hard to make recommendations for improving the interview technique as too few interviews were conducted, however it has become more and more apparent the importance of gaining the trust of people and building a rapport to engage them in an interview. In addition, questions on participants' eating habits and food choices outside of work time would have been useful and allow for comparisons to be made.

Time constraints make it increasingly difficult for staff to participate so perhaps recruiting to interviews requires different techniques in the workplace setting, maybe pre-booking interview times, and handing out a leaflet at the canteen or emailing may be more fruitful.

4.7 Strengths and Limitations of the Study

A limitation of this study is the focus on the North East of England workplaces, and that the study sample selected is not representative of the working population nationally. Furthermore, as each worksite and workforce have different characteristics and must be treated individually, the outcomes may not be applicable to other workplaces, for instance workplaces in town centre offices where the workforce have greater access to the high street and shops for food options. As this research has identified, interventions must be targeted at the individual workplace, taking into account the size, location, and nature of the work as well as workforce size and needs.

Recruitment of workplaces and external caterers was difficult, and recruitment of users of each establishment even more so. Canteen

management were happy to participate in the study interviews, but mobile vendors were reluctant to, and catering users simply did not have time to participate in interviews. As a result, alternative data collection methods were needed, and a ‘secret shopper’ techniques was implemented. Having to conduct a ‘secret shopper’ of sites meant that some data may have been missed that would have been obtained from discussions, for example: menus were collected from caterers when possible, and to some extent ingredients and cooking method were noted. However, no recipe data was available, therefore it is not possible to conduct rigorous nutritional quality assessment on the food being offered. Food prices were not always in clear view or listed on menus, so no price data was collected at mobile vans and cafes/restaurants in industrial units. Without the recipe analysis or food pricing, it was not possible to compare nutritional quality or price of food from canteens and off-site/mobile caterers.

Although there were limitations of the ‘secret shopper’ data collection method, the purpose of this study was not to assess individual dietary habits and behaviour; the purpose was to identify the general availability of food to workers. By employing this technique, some data at least was collected, and the checklist was fully completed allowing for comparisons to be made.

During interviews, the assumption was made inadvertently that the canteen user knew what a healthier option was, so this type of question would need to be revised and reworked for further studies. However, canteen users’ responses did match up with the healthier alternatives that were identified on sale on the Food Checklist audit, so it can be assumed that they did know a healthier option from a less healthy option. It is acknowledged that had this not been the case, the findings would have been impacted.
Not interviewing users of the canteen/mobile caterers/cafes is also a limitation, and means it is not possible to identify the workforces’ dietary habits at work i.e. if they eat their own food, if they eat at their desk etc. or their dietary habits outside of work time. As only two interviews were conducted at the same worksite canteen, themes were repeated as expected, however the data was useful in identifying what food is available to

the workforce, and also that healthier options can and have been successfully introduced to this workplace canteen, which have proven popular with canteen users. Furthermore, the interview data has verified and strengthened the data collected in the food environment checklist.

The intention was to interview users of the mobile catering vans but they were not willing to be interviewed, stating that they didn't have time as they were on their lunchbreak. In terms of food choices, the results may have differed if it had been possible to gather this data, as there was less of a choice at the vans and cafes overall compared to the canteen. However, this study has identified that there were healthier options available, even if on request, so the lack of data from this populations might not affect the results or conclusions significantly. Further studies that gather this information are warranted (Reznar et al., 2019).

It is acknowledged that the observations in the canteens and mobile caterers were not conducted on the same day. Food availability may have changed over the week, and day specials such as 'Fish Fridays' were not captured in the data collection as a result of only visiting sites once. It is unclear if the workforce accesses the canteen or mobile caterer at all, nor whether the same individuals accessed the canteen or mobile caterer on different days (i.e. van on day one, canteen the next). Attempts were made to conduct observations in worksites on the same day of the week (Tuesday) to aim for consistency across worksites. Although this was applicable to worksite canteens, it was not possible to visit mobile caterers/cafes on the same day of the week due to the volume of sites to visit in a short period of time.

It is recognised that conducting the observations at lunch times only means that data on breakfast provision and sales of food early morning were missed. This data would be useful alongside out-of-office eating habits to form a bigger picture of the workforces' eating patterns. Furthermore, anyone with alternative working patterns did not have the opportunity to take part.

4.8 Subsequent Research

The findings from this study have helped to identify what food is available to the workforce, who provides the food and what factors influence food choice. There are some findings that warrant further investigation as follows.

In Chapter 3 it became apparent that workplace management were happy to allow the 'van man' onto site as it served a purpose, by providing on-site catering but without any cost to or responsibility of the company. Furthermore, information gathered during the recruitment process revealed that workplaces with canteens commonly have an external company running the canteen. This raises interesting questions about what role workplace management have in decision making with regards to food provision in work when external catering companies are managing the canteen. This warrants further investigation.

Mobile vendors tended to provide healthier options on request, on a supply and demand basis to keep waste and financial loss to a minimum. This raises the questions of how much can mobile catering realistically change and what is the incentive especially when customers may not engage with healthier alternatives as demonstrated in this study? Further research is needed to answer these questions.

As highlighted in this study, there are factors that influence recruiting workplaces, and external food providers, and the workforce to dietary studies. Further research is needed in how to address this issue, such as offering incentives to workplaces and catering companies to take part in food audits as part of campaigns such as BHWA; implementing changes in policy at local council level to audit mobile vans and cafes/restaurants; and involving the workforce to help inform what healthier alternatives they would want and buy.

This study has begun to identify some seemingly simple interventions that are easy to implement and cost neutral that could help the workforce engage

in healthier dietary behaviours. However further research is needed to test the feasibility and success of these interventions in catering establishments. Research that incorporates the views and opinions of the workforce and food providers would be useful to help inform the types of healthier foods they want, whilst simultaneously engages workplace management to invest in the health of their workforce by being more active involvement in what foods are offered onsite. It is not yet clear what this would entail, therefore following up with participants from this research study to ascertain whether changes suggested would be acceptable to them and also to food providers is a recommendation for future research.
Despite identifying that there is a broad choice of food provision for the workforce, this study provides further evidence that there is a lack of provision outside of daytime working hours, including weekends, evenings and early morning. This warrants further research into what food the workforce access, and how, and at what if any nutritional cost?

An interesting finding from the research conducted as part of this study is that there is a new frontier in workplace food, that of food being delivered to workplaces. General observations since the data was collected for this study have shown that in the past 12 months there is an increase in the sightings of mobile vans that drive to and between worksites, not only in industrial sites but in other workplace locations such as campuses, retails outlets and town centres. Further research is needed in this area to ascertain what food is provided by these vans in order to make comparisons with other food providers.

4.9 Conclusion

The findings from this study have helped to identify what food is available to the workforce, who provides the food and what factors influence food choice. This data has enabled initial comparisons between providers and informing how workplaces can improve food provision and encourage uptake of healthier options amongst workers. The availability of foods to the workforce

overall was plentiful across all sites, however food quality varied. The food available at canteens was overall of a higher nutritional quality than that at mobile vans and cafes/restaurants in industrial sites. Healthier alternatives had been successfully implemented but it appears that the interest and demand for healthier alternatives varied between sites, and mobile vendors tended to provide healthier options on request, on a supply and demand basis.

There was evidence that the convenience, availability, and pricing of foods heavily influenced users' choices. The location of the mobile catering vans and the cafes/restaurants in industrial units was convenient for workers, and the delivery/pick up service for customers was also perceived to be convenient and popular amongst local workplaces.

The role of workplace management in onsite food provision remains unclear, however external catering companies and canteen management have a great influence on food provision for the workforce. Canteen management influence food availability, food quality and food pricing and were responsible for the layout of the items in the canteen. These findings further highlight the need for workplace management to appreciate the mutual benefits of investing in the workforces' health in terms of increased productivity, a reduction in absenteeism and presenteeism.

This research has suggested some simple changes to food provision and choice architecture that appear to be, and indeed seem to have already been, implemented easily without additional costs to businesses, and importantly could be implemented at all establishments. Food product placement, presentation and sizing with nutrition labelling if possible, would make engaging in healthier dietary behaviours easier for consumers.

It is evident that there is a need for flexibility when measuring the food environment. There are factors that influence recruiting workplaces, external food providers, and the workforce themselves to participate. Techniques need to be implemented to address these issues such as offering incentives

to workplaces and catering companies to take part in food audits as part of campaigns such as BHWA; implementing changes in policy at local council level to audit mobile vans and cafes/restaurants; and involving the workforce to help inform what healthier alternatives they would want and buy. For any intervention to be considered, it must be mutually beneficial to the workforce and to the food provider (canteen, mobile van, and other external caterers) in terms of acceptability and cost.

There appears to be a new frontier in workplace food, that of food being delivered to workplaces. Further research is needed to ascertain the type of foods and the nutritional quality of food provided in this way to make comparisons with other food providers.

Chapter Five: Discussion and Conclusions

5.1 A Reminder of the Context of this Research

As outlined in Chapter 1, the workplace environment has been identified as an ideal setting for health behaviour interventions (Lake et al., 2004) in which to tackle diet and lifestyle behaviours (Black, 2008). Workplace interventions can target a large proportion of the adult population and a wide range of demographics tend to be at one workplace. There is a far-reaching intervention effect influencing other family members, children, and within the wider community from such interventions. Modern day communication channels such as electronic mail and staff intranet make intervention delivery in workplaces easier and efficient. Furthermore, prevalence of overweight and obesity varies by age, with higher prevalence in older age groups amongst both men and women (WHO, 2015). With an aging population and a greater proportion of people working past retirement age, the positive impact of workplace interventions could be seen across the working lifespan.

Increasing evidence suggests that workplaces are environments that can perpetuate obesogenic behaviours. The workplace food environment with inadequate eating facilities, cooking or reheating facilities, and places to sit and eat, rarely offer healthy food choices (Nobrega et al., 2016, Bajorek and Bevan., 2019). The influence of ‘non-home’ food environments surrounding workplaces on dietary intake is also now apparent with evidence showing that access to healthier foods near to workplaces is associated with healthier food consumption amongst workers (Thornton et al., 2013; Burgoine and Monsivais., 2014). Those in employment may be relying more on food stores in closer proximity to, or on the way to and from, their place of employment as not only a place to purchase and eat food whilst in work, but also where they conduct their main food shopping (Kerr et al., 2012) thus having a broader impact on household and family food provision.

There are a number of workplace-based interventions that have attempted to change dietary behaviour and had varied success. Techniques such as

education, counselling and alterations to the physical environment of the workplace have all been successfully implemented to modify dietary intake (Lassen et al., 2004, Sorensen et al., 1999). In addition, a number of systematic reviews into workplace interventions have shown that environmental modifications and education in relation to diet, physical activity, and lifestyle factors have, in general, lead to moderate improvement in dietary intake in the short-term (Geaney et al., 2013, Maes et al., 2012, Ni Mhurchu et al., 2010).

Few UK-based workplace intervention studies have been published with fewer still focusing on the practicalities and implications when running an intervention within the workplace setting (WHO, 2003), and there is still uncertainty about the effectiveness of dietary interventions in the workplace, particularly in the long term (Schliemann and Woodside., 2019). The lack of evidence regarding the role of worksites and in particular the failure of many interventions to recognise and address the complexity of the work environment has been acknowledged. Furthermore, there is a need to evaluate any differential impacts of interventions by socio-economic status (Hillier-Brown et al., 2014, Lake et al., 2016).

5.2 Reminder of the Research Objectives of this Thesis

The objectives of this research were to:

1. Identify the effectiveness of current dietary interventions in the workplace to facilitate an understanding of what works, why, how, and for whom.

2. Identify key components of interventions and theoretical models of behaviour change, underpinning successful (and unsuccessful) dietary interventions in the workplace.

3. Explore the views of those involved in commissioning, designing and delivering dietary interventions in North East workplaces.

4. Identify what food is available to the workforce (i.e. in the canteen, vending machines, mobile caterers) and explore the views of food providers and users (the workforce) about food provision.

5. Gather data on nutritional quality of the food available to the workforce.

6. Explore factors that will inform the development of interventions aimed at changing dietary behaviours in the workplace setting.

The objectives of this thesis were met through the following studies:

1) Conducting a systematic review and meta-analysis of the effectiveness of workplace dietary interventions

2) Conducting a qualitative study exploring the views and experiences of those designing and implementing dietary interventions in workplaces in North East England

3) An exploration of the broader workplace and neighbourhood food environment and perceptions of those providing food to the workforce

5.3 Multiple Mixed Methods Research

Multiple mixed methods research was used to answer the aims and objectives of this thesis by collecting in parallel (concurrent/convergent mixed methods sampling) a quantitative systematic review with meta-analysis plus narrative summary, and qualitative interviews. The results of the qualitative interviews informed the methodology for the subsequent sampling

(sequential mixed methods sampling) and conducting observations, gathering quantitative audit data, and further qualitative interviews. The following is a breakdown of each study conducted as part of this research and the objectives they were intending to answer. As the research was conducted and analysed, it became clear that each study may have answered more than the intended objectives mentioned below, which is clarified in the following section.

5.3.1 Systematic Review

The systematic review and meta-analysis were conducted to identify the effectiveness of current dietary interventions in the workplace to facilitate an understanding of what works, why, how, and for whom (objective 1); and to identify key components of interventions and theoretical models of behaviour change, underpinning successful (and unsuccessful) dietary interventions in the workplace (objective 2).

5.3.2 Qualitative Interviews

The qualitative work was conducted to explore the views of those involved in commissioning, designing and delivering dietary interventions in North East workplaces (objective 3) which informed the food environment study, that went on to explore the experiences and opinions of workplace canteen management and users.

5.3.3 Observational and Quantitative Audit Data Collection

Findings from the qualitative study (chapter 3) informed the food environment study (chapter 4). This study was conducted to identify what food is available to the workforce (i.e. in the canteen, vending machines, mobile caterers) (objective 4), and to gather data on nutritional quality of the food available to the workforce (objective 5).

5.4 Discussion of Findings

The following is a discussion of the findings from each study conducted as part of this body of work to address each of the main objectives of the thesis in turn.

5.4.1 Objective 1. To Identify the Effectiveness of Current Dietary Interventions in the Workplace to Facilitate an Understanding of What Works, Why, How, and for Whom.

5.4.1.1 Systematic Review (Chapter 2)

The review highlighted that workplace dietary interventions can change dietary behaviour as results showed the majority of included interventions were successful. Targeted interventions that incorporate employee guided and peer education programmes resulted in favourable effects in fruit and vegetable and/or fat outcomes. Making use of the workplace methods of communication and incorporating individualised, tailored, computer messaging along with a peer helper support programme has also led to favourable effects. This further emphasises the suitability of workplaces as a setting for behaviour change interventions.

Although limited, there was evidence that workplace dietary interventions targeting low SES groups were successful at improving at least one dietary outcome, suggesting that these interventions do have the potential to reduce health inequalities.

5.4.1.2 Qualitative Interview Study (Chapter 3)

The interviews conducted as part of chapter 3 identified that there are currently a number of interventions conducted in workplaces across the NE of England. Examples of successful dietary interventions included those that provided healthier free foods, made changes to the workplace food environment (provision and labelling of healthier products), provided tools to aid dietary change, provided electronic resources, made use of electronic

communication channels, provided free sessions aimed at dietary change and/or weight loss/management.

The SEM identified that **i**nterventions involving delivery of health messages in an unstructured manner with sessions being conducted at lunchtimes and offering incentives saw favourable changes to dietary behaviours. Furthermore, interventions involving attendance with other colleagues for peer support were perceived to be successful and encouraged individuals to take part in initiatives. Interventions being well-advertised and communicated via different channels, were also reported to be facilitators to recruitment and retention. Furthermore, if managers were supportive, in terms of staff accessing initiatives, this was perceived as having a positive impact on uptake and retention, and the converse was also true.

5.4.2 Objective 2. To Identify Key Components of Interventions and Theoretical Models of Behaviour Change, Underpinning Successful (and Unsuccessful) Dietary Interventions in the Workplace.

5.4.2.1 Systematic Review (Chapter 2)

The Systematic Review identified that there were a number of Behaviour Change Techniques and Choice Architecture Interventions that were effective in workplace-based interventions targeting dietary behaviours. Promising BCTs that appear to be the most effective in increasing fruit and/or vegetable intake were ‘Provide information on consequences of behaviour in general’, and promising CAIs ‘labelling’ and ‘prompting’ (and the availability of fruit and/or vegetables to a lesser extent). Promising BCTs that appear to be the most effective in decreasing dietary fat intake were ‘Provide information on consequences of behaviour to individual’, and promising CAIs ‘availability’ of foods, ‘prompting’ (and to a lesser extent labelling). Although fewer studies investigated interventions incorporating environmental changes, this seems to be an effective approach to changing individuals’ dietary behaviour.

Importantly, information provision techniques were used in most of the interventions however, those interventions that were successful tended to use additional techniques. There appears to be a trend to suggest that interventions incorporating a greater number of strategies (BCTs and CAIs) could be more effective at changing dietary behaviours.

5.4.2.2 Workplace Food Environment Study (Chapter 4)

The observations conducted in Chapter 4 identified that there are a number of CAIs utilised in workplace canteens and in external catering that influence the workforce food choices. The CAIs identified could easily be adapted to 'nudge' individuals to engage with healthier alternatives at no or little cost financially or in time for providers.

The placement of products in a prominent position, in close proximity to the entrance, is a successful way to encourage sales of items, including healthier alternatives. For example, placing fruit at the entrance to the canteen, vegetables next to the other side options at the main meals counter, low sugar and salt condiments next to the originals, diet drinks next to full fat and sugar varieties in fridges. This technique is applicable for less healthier items such as high calorie snack items in close proximity to the tea and coffee facilities to prompt a sale.

The way in which food is presented, can encourage people to make healthier choices but is an underused technique. Having a wider variety and availability of foods allows the customer to make healthier choices. Offering a smaller portion size is an effective technique if the prices are adjusted accordingly to reflect the smaller portion size. Food labelling on packaging is also a method in which customers can identify the healthier options and make an informed choice.

5.4.3 Objective 3. To Explore the Views of Those Involved in Commissioning, Designing and Delivering Dietary Interventions in North East Workplaces.

5.4.3.1 Qualitative Interview Study (Chapter 3)

The findings from the qualitative study reinforced that workplaces are a suitable setting for interventions targeting dietary behaviour change and that there is an increasing demand for such initiatives. A number of successful dietary interventions were identified that were currently being implemented in workplaces in the North East region. The SEM model indicates that workplaces under financial pressure (austerity) may result in a management decision to close onsite catering and canteens. Without an onsite price-competitive canteen the workforce often relies heavily on external sources of catering and food provision whilst at work. In addition, a key finding from this study was that in order to be able to develop and deploy a workplace intervention it is crucial to actively involve those responsible for management. Only with their involvement can interventions be successfully implemented and barriers to participation eliminated.

Overall, the recommendations from this study show that when aiming to change dietary behaviours in workplaces, future interventions should not only consider individual and peer influences, but also management and other stakeholders (including employees and catering suppliers). It is paramount that any strategies implemented are inclusive of all staff and consider the individual needs of the workplace and the workforce i.e. size, location.

5.4.4 Objective 4. To Identify What Food is Available to the Workforce

5.4.4.1 Qualitative Interview Study (Chapter 3)

This study hinted at the food provided by external sources, such as takeaways and food outlets that pitch nearby or on site (the ‘sandwich man’ or ‘van’) and was reported to be of poor nutritional quality and served in large quantities. Further exploration of this was warranted and led to the development of Chapter 4.

5.4.4.2 Workplace Food Environment Study (Chapter 4)

The more in-depth audit of foods conducted in Chapter 4 demonstrated that there was a variety of foods available to the workforce from a range of sites, enabling initial comparisons between providers. These comparisons show that although the availability of foods overall was plentiful across all sites, the quality of food varied both between sites and within sites. Canteens versus canteens, and mobile vans versus mobile vans show wide variation in the foods that they provide, but the quality of foods on offer at canteens (and some cafes/restaurants) was superior to mobile vans and cafés/restaurants in industrial sites in general.

Each catering establishment offered a choice of fried, non-fried, and baked goods, some freshly prepared, and others pre-prepared and re-heated, or prepacked. Overall, canteens provided more baked and non-fried goods, mobile vans and cafes/restaurants in industrial units provided a greater proportion of fried to non-fried goods. There was a distinct lack of fresh fruit and vegetable provision, only seen to be provided at the canteens and some cafes/restaurants, but not at mobile vans. The workforce can only purchase what foods are available to them, and it seems that fruit and vegetables are not in plentiful supply.

There is evidence that healthier alternatives have been successfully implemented, particularly in canteens and cafes/restaurants in industrial sites, but it appears that the interest and demand for healthier alternatives was higher at workplace canteens. Perhaps this explains the plentiful provision of fruit and vegetables at this site, because the more the workforce are open to accessing healthier alternatives such as fruit and vegetables the more the caterers would provide.

Vending machines are a common feature in workplaces, often proving to be the sole means of food provision. The vending machines audited in this study dispensed high calorie, high fat confectionary or potato chip snacks, and low fat, low sugar versions of soft drinks, and hot drinks such as coffee and hot chocolate.

5.4.5 Objective 5. Gather Data on Nutritional Quality of the Food Available to the Workforce.

5.4.5.1 Qualitative Interview Study (Chapter 3)

The Qualitative Interview Study took place during a time of austerity, which has impacted on workplace health due to reported cutbacks in the provision of healthy food, not least the closure of canteens. Participants described how the workforce were feeling the economic situation and opting for cheaper alternatives, in both the workplace canteen and elsewhere.

The findings suggested that food provided by external sources, such as takeaways and food outlets that pitch nearby or on site (the 'sandwich man' or 'van') was reported to be of poor nutritional quality and served in large quantities. This unexpected finding warranted further exploration and informed the development of Chapter 4.

5.4.5.2 Workplace Food Environment Study (Chapter 4)

Due to difficulties recruiting workplaces and external caterers and having to adopt a 'secret shopper' data collection technique, it was not possible to gather recipe or food preparation data. Therefore, it is not possible to conduct rigorous nutritional quality assessment on the food being offered. Without the recipe analysis, it was not possible to compare nutritional quality of food from canteens and off-site/mobile caterers.

However, the checklist and extensive field notes taken made it possible to ascertain that the nutritional quality of the food available at canteen 1 far outweighed that at mobile vans and cafes/restaurants in industrial sites, with exceptions. There were two mobile vans and a café/restaurant that provided more baked goods to fried goods, but the majority of meals at the mobile vans and cafes/ restaurants were fried, high calorie items.

It remains the case that whilst studies exist to show that physical changes in the workplace food environment can have positive effects on dietary choice, there is a need to further explore the nutritional quality of food available at workplaces and external caterers using rigorous recipe and cooking analysis.

5.4.6 Objective 6. To Explore Factors, Including Behaviour Change Techniques, that will Inform the Development of Workplace Interventions Aimed at Changing Dietary Behaviours.

The findings from all three studies conducted as part of this body of research helped to reinforce the knowledge that workplaces are a suitable setting for interventions targeting dietary behaviour change and that there is an increasing demand for such initiatives (in light of the health inequities created by workplaces). The following is a summary from each study of the factors that inform the development of workplace interventions aimed at changing dietary behaviours.

5.4.6.1 Systematic Review (Chapter 2)

The findings from the Systematic Review identified that interventions incorporating BCTs 'providing information' whether in general or specifically for the individual show promise, and interventions incorporating environmental changes seems to be a strong approach to changing individuals' dietary behaviour. The CAIs identified as promising were 'availability', 'prompting', and 'labelling'. Furthermore, interventions that incorporate employee guided and peer education programmes show promise. Making use of the workplace methods of communication and incorporating individualised, tailored, computer messaging

5.4.6.2 Qualitative Interview Study (Chapter 3)

Chapter three identified that, interventions that were unstructured, delivered during lunchtimes, that offer incentives and provide peer support were more likely to be successful. Management engagement and encouragement of the workforce to participate and allow time for lunch breaks is key. To be successful interventions must be cost neutral, make use of workplace communication routes, address working patterns and work culture, and food provision needs to be wide-reaching so that all staff can engages and avoid further compounding IGIs.

5.4.6.3 Food Environment Study (Chapter 4)

This study has begun to identify some simple interventions that are easy to implement and cost neutral that could help the workforce engage in healthier dietary behaviours, including food product placement, presentation and sizing with nutrition labelling if possible. Intervention design that incorporates the views and opinions of the workforce are required. Importantly, for any intervention to be considered, it must be mutually beneficial to the workforce and to the food provider (canteen, mobile van, and other external caterers) in terms of acceptability and cost.

5.5 Implications for Research

This research has shown that workplaces can be an effective setting for dietary interventions. However, further studies with consumers are required to identify what food provision they want from their workplace and external food caterers in the vicinity (Reznar et al., 2019). This research should include whether the workforce would engage with interventions to improve the nutritional quality of food available to them and what would make accessing and purchasing healthier options more attractive. Detailed cost analysis of interventions is limited and would be useful for employers' in informing what type of intervention is feasible, in both the short (implementation) and long term (maintenance).

There is a need for studies to be carried out with workplace management to identify if there is scope for workplaces to resume providing and improve on-site food provision, and to determine how such changes can be implemented. There is also potential benefit in exploring the effectiveness of studies that target workplace management to encourage them to invest in the workforces' health and implement dietary interventions in their workplace. Educational material for management would be useful that ensures a cascade effect of knowledge and behaviour change from the top.

As suggested in chapter 1 the use of workplace communication channels is effective for intervention delivery. Such channels were in use in the workplaces that took part in this body of work, as identified by health advocates during interviews, and included providing information on healthy eating and lifestyles via staff websites and intranet such as healthy recipes and campaigns, staff emails with information on healthier options, electronic booklets on portion control, salt intake, grains, and electronic information on how to read food labels.

This research has shown that for the workforce and indeed the general public, mobile vans are easily accessible, convenient, and provide an increasingly relied upon source of food provision. Although often lacking in healthier alternatives, it was identified that that it is feasible to offer healthier alternatives and that there is a demand for this, although demand varied between sites. In addition, these data show that a wide demographic access mobile catering on a daily, sometimes more than once, basis. There is the potential therefore for mobile vans and vendors to play a key role in delivering population health interventions. There is a need for research to investigate whether there is scope for mobile and external food caterers to improve the choice and quality of food provision to the workforce, and what would make this more attractive to them to do so. However, some evidence exists to highlight their potential in public health interventions.

A similar concept to mobile vans, which bring food to certain populations, are mobile produce markets (MPMs). These are commonplace in town and cities and with lower overhead costs and greater flexibility than traditional stores they have the potential to improve local food environments by increasing access to healthy food. Furthermore, like mobile vans, MPMs can address geographical barriers to food access and are an increasingly popular method for providing access to fresh fruits and vegetables in underserved communities (Leone et al., 2019; Ylitalo et al., 2019; Hsiao et al., 2019). However, evaluation of these programs is limited, and further explanation is required of intervention development and delivery. To be effective, these types of intervention require a thorough needs analysis of the target

population, with training on food preparation. There has also so far only been a focus on fruit and vegetable intake, so there is the need to investigate how these interventions may be adapted to reduce total fat, saturated fat, salt, and total sugar intakes. Despite the limitations, these interventions utilising mobile vans and markets have reduced barriers to uptake of healthy eating, and shown potential for reducing IGIs and health inequalities by successfully targeting low-income, minority, and other vulnerable populations. The cost of items and running of the intervention is also relatively low (Leone et al., 2019; Ylitalo et al., 2019; Hsiao et al., 2019).

Another finding of this research was the increased use of food delivery and takeaway delivery options, such as Deliveroo, JustEat etc as well as mobile vans that serve workplaces. It was observed during data collection and conversations with the workplace health advocates that food ordering to workplaces is becoming increasingly popular due to the closure of onsite canteens. Ordering food to sites is popular amongst night shift workers who cannot access the same food provision as daytime workers, another example of inequality in food provision amongst the workforce.

Emerging evidence exists to show that initiatives such as providing healthy take-away dinners at work or fresh food deliveries to the workforce has potential to improve dietary habits amongst employees. One such example is a fresh food delivery to a large urban workplace that aimed to increase consumption of home-cooked meals (Feuerstein-Simon et al., 2020). Results indicated that the intervention increased consumption of home-cooked meals and fruit and vegetable intake. In addition, there was a significant reduction (89%) in the odds of reporting food insecurity amongst participants. Another example is the provision of take-away or cook at home dinners to a workforce for preparation or reheating at home (Lassen et al., 2012). Results showed that the energy density of the food on days consuming the cook at home meals was significantly lower and there was an increase in vegetable intake at the evening meal.

These studies are part of an increasing body of research that show not only the impact of workplace food service on food intake at work, but also at home amongst the families of the workforce (Fitzgerald et al., 2020). These studies show that providing the means for a healthier evening meal has potential for promoting healthy dietary habits among employees. The results reinforce the outcomes of this body of research by highlighting the importance of availability and convenience in promoting dietary behaviour change. Interventions such as this could help to reduce health inequities amongst workers and their families as well as in the wider community. Evidence such as this demonstrates the positive influence workplaces can exert on those employed within them, which in turn leads to a healthier, more productive workforce. Further research is still needed however into the longer-term effects of such workplace interventions in the UK.

A finding of this work that warrants exploration is that of how to target those at a disadvantage, such as shift workers, lower income, and lower SES population groups, through workplace interventions. This is of particular importance when considering the North East, UK region where this body of work was conducted. Few UK-based studies in workplace settings exist that target dietary behaviours and even fewer exist in the North East region of the UK. Those that do are mainly qualitative, pilot, small scale, short term studies (Lake et al., 2016; Lara et al., 2016; Giles et al., 2015). This body of research helps to highlight the needs of the North East working population and identify the components of interventions that might address the health inequalities seen in the North East region, how to reduce IGIs, whilst being far-reaching to families, wholly inclusive of the workforce, and the wider community.

Studies conducted in adults in workplace settings in the North East of England have identified various components that are effective and acceptable and ought to be considered when designing and implementing interventions in this target population. Face-to-face interviews were conducted with individuals receiving free fruit at work for 18 weeks (Lake et al., 2016). Five themes emerged from the data and included: the office

relationship with food; desk-based eating; males and peer support; guilt around consumption of unhealthy foods; and the type of workplace influencing the acceptability of future interventions. The main findings suggest that access and availability are both barriers and facilitators to encouraging healthy eating, in this instance fruit intake, in the workplace.

A pilot RCT of a web-based platform promoting healthy eating, physical activity, and meaningful social roles (Lara et al., 2016) called 'Living, Eating, Activity and Planning through retirement' (LEAP) was conducted amongst North East England workers of retirement age. Results showed that the platform was popular amongst participants, frequently visited for a mean time of 2.5 hours. Participants found the intervention and assessments acceptable and feasible, outcomes of which showed participants recognised the importance of dietary and physical activity in healthy ageing. The cost-effectiveness of the tool remains to be investigated but shows promise amongst this target population.

Evidence exists that health promoting financial incentives may be acceptable in the North East population (Giles et al., 2015) with a preference for positive rewards rather than negative penalties, and for shopping vouchers rather than cash incentives. This is an interesting finding that compliments that of this research, that monetary incentives were not always necessary in engaging in the workforce.

An example of a successful programme aimed at improving employee health and wellbeing is The Better Health at Work Award (BHWA) (Northern TUC., 2015; Better Health at Work Award., 2015). As previously outlined in chapter 3, the BHWA is an established and evidence-based workplace health improvement programme, developed to give recognition to workplaces in the North East of England that strive to improve the health and wellbeing within the workplace (Braun et al., 2015). Involving over 400 employers with the focus determined by the needs and preferences of individual workplaces, most include advice and support in relation to healthy eating. The programme is free to all organisations, across sectors, of any size in the

region. The BHWA was a key enabler in recruitment of workplaces for this body of work, and health advocates were key in identifying first-hand the needs of the workforce, and the barriers to implementing a dietary intervention in the region's workplaces.

The BHWA is an example of how to successfully implement dietary interventions in workplaces on a large scale in UK workplaces. Key components identified in chapter 2 and chapter 3 to successful dietary interventions in workplaces are utilised by BHWA, such as offering support to workplaces and staff, recruiting a health advocate within workplaces that are taking part in the programme (peer support) and involving the workforce in the planning and implementation of interventions, with no additional costs incurred.

Collectively, these examples above have shown that interventions in workplace settings in the North East, UK can be an effective way to target more vulnerable populations, and to deliver an intervention aimed at changing dietary behaviour. Further work is now needed to evaluate and ensure long term effectiveness, sustainability and reproducibility.

The findings from the systematic review and earlier research indicated that workplaces are an effective setting for intervention delivery to change dietary behaviour and identified key components of interventions that help ensure their success. However, the results were not easily replicable, and it became clear from the qualitative work that it is far more complex to design and implement such interventions in workplaces in the North East, and therefore potentially similar areas in the UK. Indeed, it is pertinent that environmental changes to canteens in the workplace are a key intervention identified in chapter 1, however, chapter 3 identified that workplaces are closing canteens in the North East region due to austerity. It is evident that there is a need to identify other ways to target the workforce to engage them in interventions to change dietary behaviour. A potentially useful approach to implementing an intervention is the very method in which the workforce is

being exposed; that of mobile vans and food delivery/takeaway to workplace settings, as discussed above.

In chapter 3, the SEM identified that there is a need for multi-component ecological interventions that address the wider context, such as environmental changes, rather than individual behaviour change interventions that can exacerbate inequalities. Consideration also needs to be given to the cost effectiveness and the feasibility of multi-component interventions. The cost incurred for developing and delivering a multi-component intervention in a workplace setting is high compared to environmental modification interventions alone (Fitzgerald et al., 2017).

System-level dietary modification in interventions has been shown to offer the most value in terms of improving employee health-related quality of life and for employers by reducing absenteeism (Fitzgerald et al., 2018). Such interventions include menu modification (reducing fat, sugar and salt), increasing fibre, fruit discounts, prominent positioning of healthier alternatives, and portion size control. Although these interventions show promise, the results show effectiveness over the short-term, therefore further research is required to determine the longer-term effects. There is evidence however, as previously presented, that interventions such as fresh food provision to the workforce, takeaway/cook at home interventions via workplaces, mobile vans and MPMs selling fresh, affordable produce are demonstrating effectiveness (Haynes et al., 1999). Not only are they effective but these interventions were relatively simple, cost-effective, cheap to provide, and already a part of everyday life for those we want to target.

At the time of writing, there is no mandatory policy on workplace food provision nor any policy on food provision from mobile catering vans and vendors except that regarding food safety, food preparation and food handling. At local authority level, national and regional chain food outlets have been encouraged to sign up to ‘The Responsibility Deal’ through which the Department of Health (England) have worked with food outlets to promote healthier ready-to-eat meals (Jebb, 2012). The types of intervention

implemented by the outlets include recipe reformulation, providing smaller portion sizes, better nutritional labelling, removing condiments and saltshakers from tables in places where food is eaten, and repackaging. Although promoted by local authorities, few food outlets signed up to the Responsibility Deal. There is very little evidence on the development, implementation, and effectiveness of these interventions in the literature.

A scoping review of academic database and grey literature searches (Hillier-Brown et al., 2017) provided a description of interventions in food outlets conducted in England. The review found that those responsible for encouraging food outlets to sign up were predominantly local government workers such as environmental health officers. Success of the intervention delivery was in part due to the support food outlets received including training and provision of equipment if required. Importantly, the interventions were cost-neutral and once implemented, became regular practice for the outlets. This evidence shows that, firstly there is a lack of uptake by food outlets to interventions such as these and that the evidence is limited as to their success. The scoping review has shown that there are effective interventions taking place at local level that are successfully improving the nutritional quality of ready-to-eat meals, however, these are voluntary interventions, not enforced and therefore uptake is sporadic, and evaluation of their effectiveness limited.

This body of research has shown that interventions that target individuals alone are not effective and can exacerbate Intervention-Generated Inequalities (IGIs). The SEM in chapter 3 has demonstrated that the wider environment must be taken into consideration when targeting dietary behaviour change. The workplace food environment plays such a key role in dietary behaviour whilst at work, and has been identified as a potentially obesogenic environment, therefore the responsibility would seemingly fall to workplace management to make the workplace food environment more health promoting. However, with a distinct lack of policy or guidance on how and what to do to implement a healthier workplace food environment, responsibility for quality food provision cannot fall to management alone.

Indeed, often those responsible for food provision on-site are external food companies free to provide whatever food sells.

As outlined in chapter 3, more guidance and information for workplace managers, canteen managers, mobile catering vendors and for the workforce is required to help to bring about dietary behaviour change, and to engage all parties collectively. It is crucial to identify the workplace needs and preferences before implementing changes to food provision, so that uptake and success of the intervention is more likely. In addition, cost of designing and delivering an intervention is a strong determinant of whether it is feasible or not.

Focus should not only fall on workplaces but also on the alternative food providers, such as the mobile van vendors and the other catering outlets in the workplace vicinity. However, there is no guarantee that vans or workplaces will start to provide healthier alternatives even if encouraged to do so because they are running a business, and if what they are currently producing sells, there is no incentive to change that. The supply of food will only change if the demand is there, or if enforced by local or national authority.

It is crucial that alternative methods to target the workforce are identified to target dietary behaviour change, and this body of work has shown that current food provision such as cook-at-home meals, mobile vans and food deliveries providing fresh produce within workplaces are demonstrating the potential to be the next frontier in workplace food provision intervention and research.

5.6 Implications for Practice

There are many factors that influence dietary behaviour, and workplace interventions may address part of the problem, but more holistic approaches are required, incorporating mental health, social factors, and the broader

environmental factors. Taking into consideration the MRC framework, this research indicates that when aiming to change dietary behaviours in workplaces future interventions should consider several factors:

The impact of individual and peer influences, but also management and other stakeholders (including employees and catering suppliers) as they play a crucial role in determining the availability, price and quality of food available to the workforce. To do this, workplace management need to get on board, and interventions need to use a participatory approach involving staff in intervention design and implementation phases. Educating workplace management on the benefits to the business of investing in the workforce (reduced absenteeism and presenteeism) may encourage them to take greater responsibility for food provision of good quality.

Mentoring and support from other workplaces that have had success with dietary initiatives would be useful, as would network opportunities to between workplaces. Cross-collaborative working between workplaces (management), outside catering companies, external food outlets and caterers could address many of the issues identified in terms of ensuring access to healthier food in the workplace.

Using employee led, peer education and support, and utilising channels of communication in workplace settings such as computer messaging have proven to be effective intervention techniques. Individualised approaches work best, compared to group approaches.

Consider the needs and preferences of the workforce to ensure they engage with the intervention which will encourage food providers to continue making healthier alternatives available. It is important to acknowledge people's food choices and food preferences and recognise that people buy what they like to eat. A full needs analysis prior to designing interventions could be helpful.

There needs to be consideration of the economic feasibility of implementing dietary interventions. Interventions need to be cost neutral to engage food

providers and ensure any changes to food provision be reasonably and proportionately priced to ensure the workforce can afford to make healthier choices. Profit-making is essential to successful business, therefore, to appeal to management, intervention cost is key.

Interventions that provide information to the workforce and employ techniques such as prompting and/or labelling and/or increasing availability of foods seem to be effective and result in changes to behaviour in relation to increasing fruit and vegetable consumption and/or reducing fat intake. These interventions make engaging in healthier dietary behaviours easier for the workforce and can be easily incorporated into interventions and with little or no cost incurred.

It is important to acknowledge the complex interaction and contribution of wider societal factors such as austerity, SES, as well as working patterns, shift work and workplace culture on food choices amongst the workforce. It is paramount that any strategies implemented are equally and easily accessible (in terms of cost and timing of sessions) for all staff, regardless of their job role, to avoid the risk of intervention-generated inequalities (IGIs). Interventions must consider the individual needs of the workplace and the workforce i.e. size, location, and remoteness of the worksite, and number of employees. Furthermore, consideration needs to be given to addressing diet and mental health issues and expanding intervention design to think about holistic broader interventions.

There needs to be emphasis on recruitment and engaging workplaces and food providers. Working with the BHWA and having contacts within workplaces aided recruitment. Also, the importance of building a positive relationship with mobile and external food caterers to overcome a lack of trust may aid in recruitment and full engagement with the research.

Changes to policy around food provision in workplaces may be warranted, to ensure consistent messages and intervention across the country, to avoid exacerbating inequalities.

5.7 Limitations and Recommendations for Future Research

Recruitment to this body of research was one of the biggest challenges, in particular gaining access to workplaces was difficult. It became clear as the recruitment effort went on that workplace canteens were often ran by external food catering companies who were reluctant to participate. After all the canteen is a business, and there is little incentive to take part in a research study that is effectively a food audit. This potentially also highlights the lack of importance that food provision has for canteen management and workplace management. Further work is required to investigate if this is the case and how to overcome these barriers. Other UK-based studies have had more success in recruiting workplaces to interventions (Fitzgerald et al., 2018) but these studies have been larger in scale and offered some feedback on cost-effectiveness of the interventions to workplaces; perhaps this is the kind of incentive workplace management would require before participating. The contacts at Northern TUC and the BHWA programmes were instrumental in recruiting health leads and advocates to the first qualitative study, a study that changed the course of this research. Making contacts and building relationships with workplace and canteen management is key to gaining access to and recruiting workplaces to take part in research.

A limitation of this work was that it was not possible to conduct more formal data collection with mobile vendors and mobile catering users due to difficulties with engagement. Suggestions to tackle this limitation and to engage these individuals in future research would be to offer an incentive, maybe menu calorie labelling or recipe adaptation suggestions that have worked well in previous studies (Hillier-Brown et al, 2019) in which out-of-home food outlets have taken suggestions on board and made changes to food provision that is acceptable to both food providers and customers.

Gathering information from the mobile catering users on their food preferences and what they feel is acceptable in terms of change to existing recipes or menu items would be a great starting point in engaging and developing relationships with vendors. Having these data may support recruitment of mobile vendors to future studies, as they often queried what they were to gain from taking part in this research study.

Arranging more convenient times for conducting interviews with mobile vendors and users may encourage engagement. As evidenced in this body of work, people reported overwhelmingly that they do not have time on their lunchbreak to sometimes eat let alone take part in a research study. In addition, making use of the successful workplace intervention channels identified in the systematic review, such as use of email and webpage for users to complete a short survey on purchase habits and food preferences. Individuals may be more likely to complete a short survey that take part in a recorded interview with someone they are not familiar with, especially around eating habits which can often seem judgemental and lead to inaccuracies in self-reported data.

Whilst conducting the data collection for this research it became clear that another key to an intervention being successful in workplace settings, is to be adaptable. Rather than focusing on one type of intervention or outcome measure, instead looking at multi-component interventions, that area adapted to the specific needs of a workplace. For instance, in the absence of an onsite canteen, this research has shown that there are alternative interventions to try. Those that are showing promise are those that utilise the mobile vans, and the food delivery/takeaways that the workforce are already engaging with.

In hindsight, it would have been preferable to have conducted and completed the systematic review of dietary interventions first, the results of which would have guided the questioning in the qualitative interviews with health leads advocates potentially resulting in more in-depth data on the practicalities of designing and implementing interventions incorporating BCTs and CAIs in

workplaces in the region. It would have been a more natural continuation of the review findings to explore the real-life application of such behaviour change techniques identified in the literature. Despite this, the qualitative data gathered from health leads and advocates showed other key determinants of behaviour change that were previously unknown and that warrant consideration for future intervention planning and delivery, such as the impact of austerity on workplaces in the region, and canteen closures, and the revelation that the workforce are relying heavily on alternative external food outlets, which typically offer food of poorer nutritional quality.

5.5 Conclusions

This body of work has identified that workplaces are appropriate settings for behaviour change and helped identify what the key components are within interventions to explain how they work and for whom. Interventions incorporating BCTs ‘providing information’ whether in general or specifically for the individual, and interventions incorporating CAIs ‘availability’, ‘prompting’, and ‘labelling’ seem to be strong approaches to changing individuals’ dietary behaviour in workplace settings. Across all food provision sites studied (workplace canteens, mobile vans, and restaurants/cafes in industrial sites) some simple interventions were identified that are easy to implement and cost neutral that could help the workforce engage in healthier dietary behaviours, these include: food product placement, presentation and sizing, with nutrition labelling if possible. Intervention design that incorporates the views and opinions of the workforce are required. Importantly, for any intervention to be considered, it must be mutually beneficial to the workforce and to the food provider in terms of acceptability and cost. To be successful interventions must be cost neutral, make use of workplace communication routes, address working patterns and work culture, engage management, provide peer support, and be employee guided. A complex systems approach is most favourable, to ensure interventions are wide-reaching and inclusive of all staff thus avoiding further compounding inequalities.

As a range of individuals, both male and female, with different jobs accessed the mobile vans, there is the potential for interventions targeting mobile catering vans to reduce inequalities and have a far-reaching effect to families and the wider community. An intervention targeting mobile catering vans could avoid intervention-generated inequalities and provide affordable, convenient, healthier food in areas where rates of obesity and NCDs are high. Some workplaces are helping by providing takeaway or fresh food, also MPMs are helping to provide more accessible fresh fruit and vegetables. Following a similar model, this work proposes that mobile vans that park near to workplaces and provide food to workforces, could be encouraged to provide healthier options, or to sell fresh produce.

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7.0 Appendices

Appendix 1: Accepted Conference Abstract

between the other 2 groups. In addition, overall evaluation of the entire population (n = 554) establishes a positive correlation between BMI and the score of questionnaires. Finally, the greater the weight loss after BS, the lower the score obtained.
Conclusion: Subjects with obesity perform many more actions for weight control than non-obese subjects. This result denies the idea that obese subjects do not care about their situation or future consequences; however, they do it so ineffectively. We suggest the idea that new strategies that conveniently take advantage of good predisposition of obese patients should be established. In addition, the evaluation of the motivational stages and the processes of change for weight management could be useful identifying those patients with better weight-response before and after BS.
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course focusing on snacks for children was suggested from the participants.

T2P34

A systematic review of the effectiveness of workplace dietary interventions

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Introduction: The lack of evidence of the role of workplaces as settings for behaviour change delivery and the failure to recognise and address the complexity of the work environment has been acknowledged. The aim of this work was to review the effectiveness of dietary interventions in the workplace, facilitating an understanding of what works, why and how by identifying key components of and examining the theoretical models of behaviour change underpinning successful dietary interventions in the workplace.
Methods: Six databases were searched (MEDLINE, EMBASE, CINAHL, PsycINFO, CENTRAL and PubMed) for randomised controlled trials

(RCTs) that assessed dietary interventions based within workplace settings in any country, with a study duration of 12 months or more. Reference lists of included studies and relevant systematic reviews were also searched and known topic experts were contacted to identify additional interventions. Interventions were coded using the CALO-RE Taxonomy. Risk of bias of the included studies was assessed using the Cochrane risk of bias tool.

eggs (46%), and women - vegetables and fruits (40%). BMI (Body Mass index) rates were correctly interpreted by 50% of respondents.
Conclusion: The knowledge of Internet users about healthy nutrition is quite high, however, general and superficial, concerning the most known and most frequently discussed issues in the media. Further education of Internet users should be focused on topics of more detailed, clear and precise recommendations provided in a simple and interesting way.

Appendix 2: Accepted Conference Abstract

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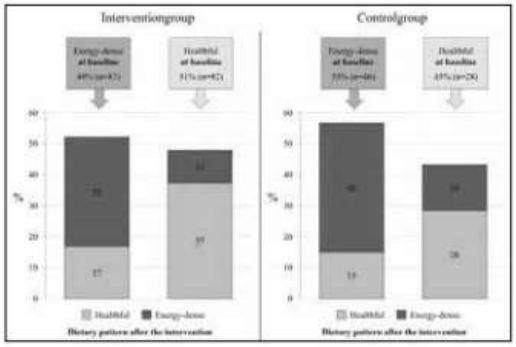

Fig. 1. Assignment changes of dietary patterns after the intervention compared with baseline for intervention and control group

PO2.141

Endothelial dysfunction and Obesity

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Introduction Chronic inflammation is a marker of endothelial damage which predisposes chronic inflammatory diseases which plays an important role in the development of atherosclerosis and diabetes mellitus and is involved in the pathophysiological mechanisms by which these two diseases are interrelated. Therefore establish the degree of chronic low-grade inflammation is a predictive and diagnostic target to start early on the appropriate treatment to delay or prevent the development of chronic diseases.

Objective: ¿Is chronic inflammation a marker of endothelial damage which in turn exacerbates or predisposed to suffer chronic inflammatory diseases?

PO2.142

Exploring the feasibility and implementation of workplace dietary interventions: Views of the intervention deliverers

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Background and Aims: Workplaces are a reasonable setting for interventions that aim to support workers in achieving a healthier diet and body weight. However, little is known about the factors that impact on the feasibility and implementation of these interventions, and how these might vary by type of workplace and type of worker.

Objective: The aim of this study was to assess the views of intervention deliverers about factors they felt impact on the feasibility and implementation of workplace dietary interventions.

Materials/Methods: One-to-one semi-structured interviews were conducted with 11 individuals who had some level of responsibility for delivering workplace dietary interventions in England. Interviews were analysed using Burnard's systematic thematic content analysis, an adaptation of grounded theory incorporating thematic and content analysis.

Results: A number of factors were felt to promote the feasibility and implementation of interventions. These included interventions that targeted the whole workforce, and those which were cost neutral (to employee and employer). Also, interventions that were delivered informally, with colleagues for peer support, on lunchtimes, and well advertised and communicated via a variety of media (staff emails, website, intranet, and posters in the canteen). In addition, the offer of an incentive, not necessarily monetary, was perceived to increase recruitment rates. A number of factors were felt to militate against the feasibility and implementation of the interventions. These included workplaces that were large scale and/or remote, working patterns that included shifts and/or working outside of normal working hours, working patterns that were not conducive to workers being able to access intervention-related sessions, and workplaces that did not have appropriate provision for healthy food on site.

Conclusion: These findings can inform the development of effective workplace dietary interventions, and suggest that such interventions should be tailored to the nature of the worksite and the profile of the workforce. Particular attention should be given to aspects of the content and delivery of workplace dietary interventions that may impact on health inequalities.

Appendix 3: Published PROSPERO Article

NIHR | National Institute for Health Research

PROSPERO
International prospective register of systematic reviews

The effectiveness of workplace dietary interventions: a systematic review and meta-analysis

Sarah Smith, Amelia Lake, Frances Hillier-Brown, Vera Araujo-Soares, Carolyn Summerbell

Citation

Sarah Smith, Amelia Lake, Frances Hillier-Brown, Vera Araujo-Soares, Carolyn Summerbell. The effectiveness of workplace dietary interventions: a systematic review and meta-analysis. PROSPERO 2015 CRD42015015175 Available from: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42015015175

Review question

To identify, critically appraise, and summarise the relevant evidence on the effectiveness and implications of interventions to promote healthier dietary behaviours in the workplace. In particular:
What workplace based interventions are effective for reducing energy intake, reducing fat intake, reducing salt intake, reducing consumption of sugar sweetened beverages and/or sweets?
What workplace interventions are effective for increasing fruit and/or vegetable consumption, and/or increasing fibre intake?
What workplace interventions are effective at reduction in and/or control of food portion size?
Are some subgroups of the population more responsive to such interventions i.e. older versus younger employees, men versus women, shift workers versus non-shift workers? Manual vs professional?
Are changes in weight, body mass index, body composition, and or waist circumference observed in response to dietary interventions in the workplace?
Are changes in employee wellbeing, productivity and absenteeism observed in response to dietary interventions in the workplace?

Searches

Databases to be searched include MEDLINE (Ovid), EMBASE (Ovid), CINAHL (Ebscohost), PsycINFO (Ebscohost), Cochrane Central Register of Controlled Trials (CENTRAL), and PubMed. Only peer-reviewed articles will be included. Articles dating back to database inception will be included. All languages will be included.
Searching other sources: Reference lists of relevant studies and systematic reviews will be searched that have been identified by inclusion criteria for the review. Known topic experts in a variety of countries will be contacted via email to enquire of any interventions they are aware of.

Types of study to be included

Studies to be included are randomised controlled trials (RCTs), non-randomised controlled trials (NRCTs), controlled before-after studies (CBAs), and interrupted time series (ITS) studies with a control group. Cochrane Effective Practice and Organisation of Care (EPOC) study design criteria were used.Studies will be excluded if they do not have an outcome that is related to diet, and if the study design is insufficient, and has no control group.

Appendix 4: Published Systematic Review Protocol

Smith et al. Systematic Reviews (2016) 5:20
DOI 10.1186/s13643-016-0200-1

Systematic Reviews

PROTOCOL Open Access

The effectiveness of workplace dietary interventions: protocol for a systematic review and meta-analysis

Sarah A. Smith[1,2*], Amelia A. Lake[1,2], Carolyn Summerbell[1,2], Vera Araujo-Soares[1,3] and Frances Hillier-Brown[1,2]

Abstract

Background: The lack of evidence of the role of workplaces as settings for behaviour change delivery and the failure to recognise and address the complexity of the work environment has been acknowledged. This systematic review and meta-analysis will identify the effectiveness of dietary interventions in the workplace facilitating an understanding of what works, why and how by identifying key components of and examining the theoretical models of behaviour change underpinning successful dietary interventions in the workplace.

Methods/design: We will conduct searches in MEDLINE, EMBASE, CINAHL, PsycINFO, CENTRAL and PubMed for studies that assess dietary interventions based within workplace settings in any country, of any length of time or duration of follow-up. We will include all randomised controlled trials (RCTs), non-randomised controlled trials (NRCTs), controlled before-after studies (CBAs) and interrupted time series (ITS) studies with a control group. Risk of bias of included studies will be assessed using a tool adapted from the Cochrane Public Health Review Group's recommended Effective Public Health Practice Project Quality Assessment Tool for Quantitative Studies. Meta-analysis will be conducted if appropriate, or a narrative synthesis will be conducted following the ESRC Narrative Synthesis Guidance.

Discussion: This paper outlines the study protocol for a systematic review and meta-analysis that will identify, critically appraise, and summarise the relevant evidence on the effectiveness and implications of interventions to promote healthier dietary behaviours in the workplace. This review will give an overview of the evidence and provide a guide for development of interventions promoting dietary behaviour change in workplaces.

Systematic review registration: PROSPERO CRD42015015175

Keywords: Workplace, Diet, Nutrition, Intervention, Health promotion, Systematic Review, Meta-analysis

Background

The increasing prevalence of adults who are overweight and obese is continuing to pose a major global public health problem. Recent WHO global estimates show that overall, about 13 % of the world's adult population

2013 [2]. In the UK in 2010, on average, obese people took four extra sick days per year [3] which for the average company equates to more than £126,000 a year in lost productivity [4]. Estimates of the indirect costs of obesity such as loss of productivity in 2001 were £15.8

Appendix 5: Search Strategy for the Systematic Review

1. employee$.ti,ab.
2. worker$.ti,ab.
3. (workforce$ or work force$).ti,ab.
4. *work/
5. *workplace/
6. (workplace$ or work place$).ti,ab.
7. (worksite$ or work site$).ti,ab.
8. (workfloor$ or work floor$).ti,ab.
9. (work adj2 environment).ti,ab.
10. *employment/
11. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10
12. *food/
13. food$.ti,ab.
14. exp diet/
15. diet$.ti,ab.
16. nutri$.ti,ab.
17. fruit/
18. fruit$.ti,ab.
19. vegetables/
20. vegetable$.ti,ab.
21. energy.ti,ab.
22. fat$.ti,ab.
23. *dietary fats/
24. salt$.ti,ab.
25. fibre$.ti,ab.
26. (sugar$ adj2 sweetened$ adj2 beverages$).ti,ab.
27. (portion$ adj2 size$).ti,ab.
28. (serving$ adj2 size$).ti,ab.
29. cafeteria$.ti,ab.
30. canteen$.ti,ab.
31. (healthy adj2 eating).ti,ab.
32. (catering$ adj2 service$).ti,ab.

33. (catering$ adj2 establishment).ti,ab.
34. (food$ adj2 service$).ti,ab.
35. exp food services/
36. (food$ adj2 environment$).ti,ab.
37. 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28
or 29 or 30 or 32 or 32 or 33 or 34 or 35 or 36
38. 11 and 37
39. intervention$.ti,ab.
40. *intervention studies/
41. campaign$.ti,ab.
42. program$.ti,ab.
43. (strategy$ or strategies$).ti,ab.
44. award$.ti,ab.
45. scheme$.ti,ab.
46. promotion$.ti,ab.
47. exp health promotion/
48. 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47
49. 38 and 48
50. (randomized controlled trial OR controlled clinical trial).pt.
51. randomized controlled trials/
52. random allocation/
53. double-blind method/
54. single-blind method/
55. 50 or 51 or 52 or 53 or 54
56. animal/ not human/
57. 55 not 56
58. clinical trial.pt.
59. clinical trials/
60. (clinic$ adj25 trial$).tw.
61. ((singl$ or doubl$ or trebl$ or tripl$) adj (mask$ or blind$)).tw.
62. Random$.tw.
63. Research Design/
64. (latin adj square).tw.

65. 58 or 59 or 60 or 61 or 62 or 63 or 64
66. 65 not 56
67. 66 not 57
68. Comparative study/
69. Evaluation studies/
70. Follow-up studies/
71. Prospective studies/
72. (control$ or prospective$ or volunteer$).tw.
73. Cross-over studies/
74. 68 or 69 or 70 or 71 or 72 or 73
75. 74 not 56
76. 75 not (57 and 67)
77. 57 or 67 or 76
78. Controlled study/
79. (Controlled Trial or non-randomised controlled trial).ti,ab.
80. Controlled adj (before and after study).ti,ab.
81. ((before and after study) adj10 control).ti,ab.
82. (Interrupted Time Series adj10 control).ti,ab.
83. 78 or 79 or 80 or 81 or 82
84. 83 or 77
85. 49 and 84
86. limit 85 to (humans)

Appendix 6: Completed PRISMA checklist for the Systematic Review

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	Page 20
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	Page 20
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	Page 20
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	Page 20
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	Page 20
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	Page 22
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	Page 21
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Page 194

Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	Page 22
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	Page 23
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	Page 24
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	Page 26
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	Page 23
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	Page 26
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	Page 26
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	Page 26
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	Page 27
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Page 29
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Page 31
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Page 34
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	Page 49
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	Page 32
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	Page 52

DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	Page 69
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	Page 71
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	Page 76
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	Page xii

Appendix 7: Data Extracted of Included Studies

Intervention studies	**Description**
Study ID	Study ID
Author	Author
Publication year	Publication year
Country	Country Intervention was Conducted
Date	Date Intervention was Conducted
Language	Language of study
Intervention Duration	Intervention Duration
Follow-up	Follow-up Details (how many FU, length between FU)
Study name	Study name
Population	Population
Sample size	Sample size
Age range	Age range
Average age	Average age
Sex (M:F)	Sex (M:F)
Ethnicity	Ethnicity of the population

Socioeconomic status (SES)	Socioeconomic status (SES)
Sample recruitment	Sample recruitment
Intervention details	Intervention details
Control group details	Control group details
Targeted Intervention	Was the Intervention targeted i.e. shift workers, low SES etc.
Theoretical model	Theoretical model underpinning the design of the Intervention
Intervention provider	Intervention providers and those responsible for data collection
Number of sites	Number of worksites included
Primary outcome	Primary outcomes listed and measured by
Secondary outcome	Secondary outcomes listed and measured by
Method of Sampling	Method of Sampling
Baseline Sample Size and Rate	Baseline Sample Size and Rate
Time between Follow-ups	Time between Follow-ups
Follow-up Response Rate	Follow-up Response Rate
Final Sample Size	Final Sample Size
Control Group	Method of Selecting Control Group
Data Collection	Method of Data Collection (self-report, FFQ, other tools etc.)
List Outcomes Reported	List Outcomes Reported

Funding Source	Funding Source

Appendix 8: Behaviour Change Techniques (BCTs) and Choice Architecture Interventions (CAIs) Checklist

Behaviour Change Technique Definitions	BCT present?	Extract from text to support decision	Certainty 0-5
1. Provide information on consequences of behaviour in general Information about the relationship between the behaviour and its possible or likely consequences in the general case, usually based on epidemiological data, and not personalised for the individual (contrast with technique 2).			
2. Provide information on consequences of behaviour to the individual Information about the benefits and costs of action or inaction to the individual or tailored to a relevant group based on that individual's characteristics (i.e. demographics, clinical, behavioural or psychological information). This can include any costs/benefits and not necessarily those related to health, e.g. feelings.			
3. Provide information about others' approval Involves information about what other people think about the target person's behaviour. It clarifies whether others will like, approve or disapprove of what the person is doing or will do. NB: Check that any instance does not also involve techniques 1 (Provide information on consequences of behaviour in general) or 2 (Provide information on consequences of behaviour to the individual) or 4 (Provide normative information about others 'behaviour).			

4. Provide normative information about others' behaviour Involves providing information about what other people are doing i.e. indicates that a particular behaviour or sequence of behaviours is common or uncommon amongst the population or amongst a specified group – presentation of case studies of a few others is not normative information. NB: this concerns other people's actions and is distinct from the provision of information about others' approval (technique 3 (Provide information about others' approval)).			
5. Goal setting (behaviour) The person is encouraged to make a behavioural resolution (e.g. take more exercise next week). This is directed towards encouraging people to decide to change or maintain change. NB: This is distinguished from technique 6 (goal setting – outcome) and 7 (action planning) as it does not involve planning exactly how the behaviour will be done and either when or where the behaviour or action sequence will be performed. Where the text only states that goal setting was used without specifying the detail of action planning involved then this would be an example of this technique (not technique 7 (action planning)). If the text states that 'goal setting' was used if it is not clear from the report, if the goal setting was related to behaviour or to other outcomes, technique 6 should be coded. This includes sub-goals or preparatory behaviours and/or specific contexts in which the behaviour will be performed. The behaviour in this technique will be directly related to or be a necessary condition for the target behaviour (e.g. shopping for healthy eating; buying equipment for physical activity). NB: check if techniques applied to preparatory behaviours should also be coded as instances of technique 9 (Set graded tasks).			
6. Goal setting (outcome) The person is encouraged to set a general goal that can be achieved by behavioural means but is not defined in terms of behaviour (e.g. to reduce blood pressure or lose/maintain weight), as opposed to a goal based on changing behaviour as such. The goal may be an expected consequence of one or more behaviours, but is not a behaviour per se (see also techniques 5 (Goal setting – behaviour) and 7 (Action			

planning)). This technique may co-occur with technique 5 if goals for both behaviour and other outcomes are set.			
7. Action planning Involves detailed planning of what the person will do including, as a minimum, when, in which situation and/or where to act. 'When' may describe frequency (such as how many times a day/week or duration (e.g. for how long). The exact content of action plans may or may not be described, in this case code as this technique if it is stated that the behaviour is planned contingent to a specific situation or set of situations even if exact details are not present. NB: The terms 'goal setting' or 'action plan' are not enough to ensure inclusion of this technique unless it is clear that plans involve linking behavioural responses to specific situational cues, when only described as 'goal setting' or 'action plan' without the above detail it should be regarded as applications of techniques 5 and 6.			
8. Barrier identification/problem solving This presumes having formed an initial plan to change behaviour. The person is prompted to think about potential barriers and identify the ways of overcoming them. Barriers may include competing goals in specified situations. This may be described as 'problem solving'. If it is problem solving in relation to the performance of a behaviour, then it counts as an instance of this technique. Examples of barriers may include behavioural, cognitive, emotional, environmental, social and/or physical barriers. NB: Closely related to techniques 7 (action planning) and 9 (set graded task), but involves a focus on specific obstacles to performance. It contrasts with technique 35 (relapse prevention/coping planning), which is about maintaining behaviour that has already been changed.			
9. Set graded tasks Breaking down the target behaviour into smaller easier to achieve tasks and enabling the person to build on small successes to achieve target behaviour. This may include increments towards target behaviour or incremental increases from baseline behaviour. NB: The key difference to technique 7 (Action planning) lies in planning to			

perform a sequence of preparatory actions (e.g. remembering to take gym kit to work), task components or target behaviours which are in a logical sequence or increase in difficulty over time – as opposed to planning 'if-then' contingencies when/where to perform behaviours. General references to increasing physical activity as intervention goal are not instances of this technique.			
10. Prompt review of behavioural goals Involves a review or analysis of the extent to which previously set behavioural goals (e.g. take more exercise next week) were achieved. In most cases, this will follow previous goal setting (see technique 5, 'goal setting-behaviour') and an attempt to act on those goals, followed by a revision or readjustment of goals, and/or means to attain them.NB: Check if any instance also involves techniques 6 (goal setting – behaviour), 8 (barrier identification/problem solving), 9 (set graded tasks) or 11 (prompt review of outcome goals).			
11. Prompt review of outcome goals Involves a review or analysis of the extent to which previously set outcome goals (e.g. to reduce blood pressure or lose/maintain weight) were achieved. In most cases, this will follow previous goal setting (see technique 6, goal setting-outcome') and an attempt to act on those goals, followed by a revision of goals, and/or means to attain them. NB: Check that any instance does not also involve techniques 5 (goal setting – outcome), 8 (barrier identification/problem solving), 9 (set graded tasks) or 10 (prompt review of behavioural goals).			
12. Prompt rewards contingent on effort or progress towards behaviour Involves the person using praise or rewards for attempts at achieving a behavioural goal. This might include efforts made towards achieving the behaviour or progress made in preparatory steps towards the behaviour, but not merely participation in intervention. This can include self-reward.			

NB: This technique is not reinforcement for performing the target behaviour itself, which is an instance of technique 13 (provide rewards contingent on successful behaviour			
13. Provide rewards contingent on successful behaviour Reinforcing successful performance of the specific target behaviour. This can include praise and encouragement as well as material rewards but the reward/incentive must be explicitly linked to the achievement of the specific target behaviour i.e. the person receives the reward if they perform the specified behaviour but not if they do not perform the behaviour. This can include self-reward. Provisions of rewards for completing intervention components or materials are not instances of this technique. References to provision of incentives for being more physically active are not instances of this technique unless information about contingency to the performance of the target behaviour is provided. NB: Check the distinction between this and techniques 7 (action planning) and 17 (prompt self-monitoring of behavioural outcome) and 19 (provide feedback on performance).			
14. Shaping Contingent rewards are first provided for any approximation to the target behaviour e.g. for any increase in physical activity. Then, later, only a more demanding performance, e.g. brisk walking for 10 min on 3 days a week would be rewarded. Thus, this is graded use of contingent rewards over time.			
15. Prompting generalisation of a target behaviour Once behaviour is performed in a particular situation, the person is encouraged or helped to try it in another situation. The idea is to ensure that the behaviour is not tied to one situation but becomes a more integrated part of the person's life that can be performed at a variety of different times and in a variety of contexts.			
16. Prompt self-monitoring of behaviour			

The person is asked to keep a record of specified behaviour(s) as a method for changing behaviour. This should be an explicitly stated intervention component, as opposed to occurring as part of completing measures for research purposes. This could e.g. take the form of a diary or completing a questionnaire about their behaviour, in terms of type, frequency, duration and/or intensity. Check the distinction between this and techniques 17 (prompt self-monitoring of behavioural outcome).			
17. Prompt self-monitoring of behavioural outcome The person is asked to keep a record of specified measures expected to be influenced by the behaviour change, e.g. blood pressure, blood glucose, weight loss, physical fitness. NB: It must be reported as part of the intervention, rather than only as an outcome measure. Check the distinction between this and techniques 16 (Prompt self-monitoring of behaviour).			
18. Prompting focus on past success Involves instructing the person to think about or list previous successes in performing the behaviour (or parts of it). NB: This is not just encouragement but a clear focus on the person's past behaviour. It is also not feedback because it refers to behaviour preceded the intervention.			
19. Provide feedback on performance This involves providing the participant with data about their own recorded behaviour (e.g. following technique 16 (prompt self-monitoring of behaviour)) or commenting on a person's behavioural performance (e.g. identifying a discrepancy with between behavioural performance and a set goal – see techniques 5 (Goal setting – behaviour) and 7 (action planning) – or a discrepancy between one's own performance in relation to others' – note this could also involve technique 28 (Facilitate social comparison).			
20. Provide information on where and when to perform the behaviour Involves telling the person about when and where they might be able to perform the behaviour this e.g. tips on places and times participants can access local exercise			

classes. This can be in either verbal or written form. NB: Check whether there are also instances of technique 21 (Provide instruction on how to perform the behaviour).			
21. Provide instruction on how to perform the behaviour Involves telling the person how to perform behaviour or preparatory behaviours, either verbally or in written form. Examples of instructions include; how to use gym equipment (without getting on and showing the participant), instruction on suitable clothing, and tips on how to take action Showing a person how to perform a behaviour without verbal instruction would be an instance of technique 22 only. NB: Check whether there are also instances of techniques 5, 7, 8, 9 and 22. Instructions to follow a specific diet or programme of exercise without instructions how to perform the behaviours are not included in this definition. Cooking and exercise classes as well as personal trainers and recipes should always be coded as this technique, but may also be coded as 22 (model/demonstrate the behaviour).			
22. Model/Demonstrate the behaviour Involves showing the person how to perform a behaviour e.g. through physical or visual demonstrations of behavioural performance, in person or remotely. NB: This is distinct from just providing instruction (technique 21) because in 'demonstration' the person is able to observe the behaviour being enacted. This technique and techniques 21 (Provide instruction on how to perform the behaviour) and may be used separately or together. Instructing parents or peers to perform the target behaviour is not an instance of this technique as fidelity would be uncertain.			
23. Teach to use prompts/cues The person is taught to identify environmental prompts which can be used to remind them to perform the behaviour (or to perform an alternative, incompatible behaviour in the case of behaviours to be reduced). Cues could include times of day, particular contexts or technologies such as mobile phone alerts which prompt them to perform the target behaviour. NB: This technique could be used independently or in			

conjunction with techniques 5 (goal setting - behaviour) and 7 (action planning; see also 24 (environmental restructuring)).			
24. Environmental restructuring The person is prompted to alter the environment in ways so that it is more supportive of the target behaviour e.g. altering cues or reinforcers. For example, they might be asked to lock up or throw away or their high calorie snacks or take their running shoes to work. Interventions in which the interveners directly modify environmental variables (e.g. the way food is displayed in shops, provision of sports facilities) are not covered by this taxonomy and should be coded independently.			
25. Agree behavioural contract Must involve written agreement on the performance of an explicitly specified behaviour so that there is a written record of the person's resolution witnessed by another.			
26. Prompt practice Prompt the person to rehearse and repeat the behaviour or preparatory behaviours numerous times. Note this will also include parts of the behaviour e.g. refusal skills in relation to unhealthy snacks. This could be described as 'building habits or routines' but is still practice so long as the person is prompted to try the behaviour (or parts of it) during the intervention or practice between intervention sessions, e.g. as 'homework'.			
27. Use of follow-up prompts Intervention components are gradually reduced in intensity, duration and frequency over time, e.g. letters or telephone calls instead of face to face and/or provided at longer time intervals.			
28. Facilitate social comparison Involves explicitly drawing attention to others' performance to elicit comparisons.			

NB: The fact the intervention takes place in a group setting, or have been placed in groups on the basis of shared characteristics, does not necessarily mean social comparison is actually taking place. Social support may also be encouraged in such settings and this would then involve technique 29 (plan social support/social change). Group classes may also involve instruction (technique 21 (provide instruction on how to perform the behaviour)) demonstration (technique 22 (model/demonstrate the behaviour)) and practice (technique 26 (prompt practice)).			
29. Plan social support/social change Involves prompting the person to plan how to elicit social support from other people to help him/her achieve their target behaviour/outcome. This will include support during interventions e.g. setting up a 'buddy' system or other forms of support and following the intervention including support provided by the individuals delivering the intervention, partner, friends and family.			
30. Prompt identification as role model/position advocate Involves focusing on how the person may be an example to others and affect their behaviour, e.g. being a good example to children. Also includes providing opportunities for participants to persuade others of the importance of adopting/ changing the behaviour, for example, giving a talk or running a peer-led session.			
31. Prompt anticipated regret Involves inducing expectations of future regret about the performance or non-performance of a behaviour. This includes focusing on how the person will feel in the future and specifically whether they will feel regret or feel sorry that they did or did not take a different course of action. Do not also code instances of this technique as the more generic providing information on consequences (techniques 1 (provide information on consequences of behaviour in general and 2 (provide information on consequences of behaviour to the individual)).			

32. Fear arousal Involves presentation of risk and/or mortality information relevant to the behaviour as emotive images designed to evoke a fearful response (e.g. 'smoking kills!' or images of the grim reaper). Do not also code instances of this technique as the more generic providing information on consequences (techniques 1 (provide information on consequences of behaviour in general) and 2 (provide information on consequences of behaviour to the individual)).			
33. Prompt self-talk Encourage the person to use talk to themselves (aloud or silently) before and during planned behaviours to encourage, support and maintain action.			
34. Prompt use of imagery Teach the person to imagine successfully performing the behaviour or to imagine finding it easy to perform the behaviour, including component or easy versions of the behaviour. Distinct from recalling instances of previous success without imagery (technique 18 (prompting focus on past success)).			
35. Relapse prevention/coping planning This relates to planning how to maintain behaviour that has been changed. The person is prompted to identify in advance situations in which the changed behaviour may not be maintained and develop strategies to avoid or manage those situations. Contrast with techniques 7 (action planning) and 8 (barrier identification/problem solving) which are about initiating behaviour change.			
36. Stress management/emotional control training This is a set of specific techniques (e.g. progressive relaxation) which do not target the behaviour directly but seek to reduce anxiety and stress to facilitate the performance of the behaviour. It might also include techniques designed to reduce negative emotions or control mood or feelings that may interfere with performance of the behaviour,			

and/or to increase positive emotions that might help with the performance of the behaviour. NB: Check whether there are any instances of technique 8 (barrier identification/problem solving), which includes identifying emotional barriers to performance, in contrast to the current technique, which addresses stress and emotions, whether they have been identified as barriers or not.			
37. Motivational interviewing This is a clinical method including a specific set of techniques involving prompting the person to engage in change talk in order to minimise resistance and resolve ambivalence to change (includes motivational counselling). NB: Only rate this technique if explicitly referred to by name, not if one identifies specific elements of it, this may happen if you have prior experience with this technique.			
38. Time management This includes any technique designed to teach a person how to manage their time in order to make time for the behaviour. These techniques are not directed towards performance of target behaviour but rather seek to facilitate it by freeing up times when it could be performed. NB: Only rate this technique if explicitly referred to by name, not if one identifies specific elements of it, this may happen if you have prior experience with this technique.			
39. General communication skills training This includes any technique directed at general communication skills but not directed towards a particular behaviour change. Often this may include role play and group work focusing on listening skills or assertive skills. NB: Practicing a particular behaviour-specific interpersonal negotiation e.g. refusal skills in relation to cigarettes or alcohol would not be an instance of this technique.			

40. Stimulate anticipation of future rewards Create anticipation of future rewards without necessarily reinforcing behaviour throughout the active period of the intervention. Code this technique when participants are told at the onset that they will be rewarded based on behavioural achievement.			
TIPPME	**Intervention present?**	**Extract from text to support decision**	**Certainty 0-5**
41. Primarily alter properties of objects or stimuli: AMBIENCE Alter aesthetic or atmospheric aspects of the surrounding environment			
42. Primarily alter properties of objects or stimuli: FUNCTIONAL DESIGN Design or adapt equipment or function of the environment			
43. Primarily alter properties of objects or stimuli: LABELLING Any labelling or endorsement information to product or at pint-of-choice			

44. Primarily alter properties of objects or stimuli: PRESENTATION Alter sensory qualities or visual design of the product			
45. Primarily alter properties of objects or stimuli: SIZING Change size or quantity of product			
46. Primarily alter placement of objects or stimuli: AVAILABILITY Add behavioural options within a given micro-environment			
47. Primarily alter placement of objects or stimuli: PROXIMITY Make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort			
48. Alter both properties and placement of objects or stimuli: PRIMING Place incidental cues in the environment to influence a non-conscious behavioural response			
49. Alter both properties and placement of objects or stimuli: PROMPTING Use non-personalised information to promote or raise awareness of a behaviour			

Appendix 9: Published Article

Smith et al. BMC Public Health (2017) 17:808
DOI 10.1186/s12889-017-4810-x

BMC Public Health

RESEARCH ARTICLE Open Access

Designing equitable workplace dietary interventions: perceptions of intervention deliverers

Sarah A. Smith[1,2*], Shelina Visram[1,4], Claire O'Malley[1,2], Carolyn Summerbell[1,3], Vera Araujo-Soares[1,4], Frances Hillier-Brown[1,4] and Amelia A. Lake[1,5]

Abstract

Background: Workplaces are a good setting for interventions that aim to support workers in achieving a healthier diet and body weight. However, little is known about the factors that impact on the feasibility and implementation of these interventions, and how these might vary by type of workplace and type of worker. The aim of this study was to explore the views of those involved in commissioning and delivering the Better Health at Work Award, an established and evidence-based workplace health improvement programme.

Methods: One-to-one semi-structured interviews were conducted with 11 individuals in North East England who had some level of responsibility for delivering workplace dietary interventions. Interviews were transcribed verbatim and analysed using thematic framework analysis.

Results: A number of factors were felt to promote the feasibility and implementation of interventions. These included interventions that were cost-neutral (to employee and employer), unstructured, involved colleagues for support, took place at lunchtimes, and were well-advertised and communicated via a variety of media. Offering incentives, not necessarily monetary, was perceived to increase recruitment rates. Factors that militate against feasibility and implementation of interventions included worksites that were large in size and remote, working patterns including shifts and working outside of normal working hours that were not conducive to workers being able to access intervention sessions, workplaces without appropriate provision for healthy food on site, and a lack of support from management.

Conclusions: Intervention deliverers perceived that workplace dietary interventions should be equally and easily accessible (in terms of cost and timing of sessions) for all staff, regardless of their job role. Additional effort should be taken to ensure those staff working outside normal working hours, and those working off-site, can easily engage with any intervention, to avoid the risk of intervention-generated inequalities (IGIs).

Keywords: Workplace health, Obesity, Intervention, Diet, Inequalities

Background

Recent worldwide estimates show that 13% of adults (11% of men and 15% of women) were obese in 2014, and 39% of adults (38% of men and 40% of women) were

there is a global need to develop and evaluate dietary interventions conducted in various settings to address this growing problem [3, 4]. The workplace has the potential to be such a setting, providing an ideal environment for

Appendix 10: Email sent by Northern TUC on our behalf to Health Leads

Are you a Health Lead or Health Advocate as part of the Better Health at Work Award? If yes, we need your help!

We are a team of researchers from Durham University and we would like to invite you to take part in our study looking at nutrition and diet related programmes implemented in workplaces. We would like to speak to you about your experiences of setting up and running a diet or nutrition related programme in your workplace.

Taking part would involve talking to a researcher during a short interview lasting no more than 30 minutes. The research will be completely confidential and fully anonymised.

If you are interested in taking part, please see the information sheet attached and complete the screening questionnaire attached and send your details to Sarah Smith via email at **sarah.smith@durham.ac.uk** or telephone **0191 334 0823** (before August 14th 2015) and she will contact you to arrange a convenient time and location for your interview.

We look forward to hearing your views.

Thank you

Appendix 11: Email sent to Health Commissioners

Are you a Health Commissioner as part of the Better Health at Work Award? If yes, we need your help!

We are a team of researchers from Durham University and we would like to invite you to take part in our study looking at nutrition and diet related programmes implemented in workplaces. We would like to speak to you about your experiences of setting up and running a diet or nutrition related programme in your workplace.

Taking part would involve talking to a researcher during a short interview lasting no more than 30 minutes. The research will be completely confidential and fully anonymised.

If you are interested in taking part, please see the information sheet attached and complete the screening questionnaire attached and send your details to Sarah Smith via email at **sarah.smith@durham.ac.uk** or telephone **0191 334 0823** (before August 14th 2015) and she will contact you to arrange a convenient time and location for your interview.

We look forward to hearing your views.

Thank you

Appendix 12: Information Sheet for Participants

INFORMATION SHEET

Exploring the components of successful workplace diet and nutrition programmes

Durham University are inviting you to take part in a study to help identify and explore the experiences of designing and implementing diet and nutrition programmes within workplace settings. This could include any programmes in your workplace for example, but not be limited, offering free fruit at work, education on reducing salt intake, making changes to the food environment at work, introducing calorie labelling to foods in the canteen etc. Taking part will involve being interviewed by a researcher from Durham University.

What is the purpose of the study?

We would like to identify and explore your experiences of designing and implementing dietary interventions within workplace settings to help inform future practice in the region.

Why have I been chosen?

All Health Leads/Health Advocates who are part of the Better health at Work Award scheme in the North East region are being invited to take part in an interview. Taking part is entirely voluntary and it is up to you whether or not you take part.

What will taking part involve?

You would attend a one-off interview to hear your views by a researcher from Durham University. You will be asked to complete a consent form to confirm that you agree to take part prior to the interview. The interview will take place in private in your workplace or over the telephone and will be recorded using a Dictaphone. All the information collected in the interview will be anonymised and kept confidential. The questions you will be asked will be specifically on your experience of designing and implementing dietary interventions within the workplace, and practical issues like how were dietary interventions implemented and what has helped to deliver successful dietary interventions. If you agree to you may be contacted with regards to taking part in further work related to workplace dietary interventions.

What do I have to do?

We would ask you to give us half an hour of your time to allow a researcher from Durham University to conduct the interview with you about your experience of designing and implementing workplace dietary interventions.

What are the possible benefits of taking part?

There are no direct benefits to you, however your views may help to shape future interventions that may help other workplaces in the region to implement dietary change and benefit the wider workforce.

What are the possible risks of taking part?

The purpose of this study is to understand your experience of implementing dietary interventions in the workplace. It is unlikely that discussing this will be distressing, but if you feel at any point that you don't want to continue you can just ask the researcher to stop the interview.

Do I have to take part?

It is up to you to decide whether or not to take part. If you decide to take part, you are free to drop out at any time and without giving a reason. A decision to stop or not to take part will not affect you or your rights as an employee in any way.

What happens when the research stops?

The interview recordings will be transcribed and anonymised and analysed by the researchers at Durham University. Following this the anonymous results will be compiled as part of a PhD thesis and a short summary of the work will be submitted to Northern TUC and to you. Please let the researcher know if you wish to receive a short summary and you will be contacted again at the end of the study with the results.

Will my taking part in the study be kept confidential?

Yes. All the information collected in the interview will be kept confidential. All information collected will be stored in a locked filing cabinet within the School of Medicine, Pharmacy and Health. We will confidentially destroy any personal details about you after 5 years.

Who is organising and funding the evaluation?

The School of Medicine, Pharmacy and Health within Durham University is organising and conducting the study which is part of a PhD project funded by Fuse, the Centre for Translational Research (Further information on Fuse is available at http://www.fuse.ac.uk). This study has been reviewed and approved by Durham University School of Medicine, Pharmacy and Health Ethics committee.

Who should I contact if I have any concerns?

If you have any concerns regarding your participation in this study you can contact the lead investigator (Dr Amelia Lake: Amelia.lake@durham.ac.uk, 0191 334 0542) and/or the ethics committee chair (David Ekers: david.ekers@durham.ac.uk, 0191 334 0838).

Thank you for taking the time to read the information.

Should you now wish to take part in an interview we ask that you contact Sarah Smith for further details and to organise a convenient date and time for the interview.

Ms Sarah Smith,
PhD Research Student, Durham University, UK.
Tel: +44 (0)191 334 0823
Email:sarah.smith@durham.ac.uk

Appendix 13: Consent Form for Participants

Study Number:
Participant ID code:

CONSENT FORM FOR PARTICIPANTS

Exploring the components of successful workplace diet and nutrition programmes

	Please initial box
I confirm that I have read and understood the information sheet provided for the interview. I have had the opportunity to ask questions and have had these answered satisfactorily.	
I understand that my taking part is voluntary and that I am free to withdraw at any time, without giving a reason.	
I understand that anonymity and confidentiality will be maintained at all times and that my data will be used for the final report and subsequent publications but that I will not be identified.	
I understand that the information I provide will be kept secure in a locked filing cabinet and my personal data will be destroyed after five years.	
I understand that only the researchers will hear what I say in the interview. I agree to being interviewed and for the interview to be recorded.	
I agree to being contacted about this interview and with regards to taking part in further work related to workplace dietary interventions	

_____	_____	_____
Name of participant	Signature	Date

_____	_____	_____
Name of person taking consent	Signature	Date

Screening Questionnaire

Exploring the components of successful workplace diet and nutrition programmes

Thank you for your interest in taking part in our study. To help us to select participants for interview we require some further information from you about your role in your workplace. Please answer the following questions and send the completed form to sarah.smith@durham.ac.uk. Thank you.

Q1. What is your full name?

……

Q2. What is your email address?

……

Q3. What is your telephone number?

……

Q4. What company/workplace do you work for?

……

……

……

Q5. Roughly how many people are employed by the company you work for?

Up to 10 employees ☐ 10 – 30 employees 30 – 50 employees ☐

50 – 100 employees ☐ More than 100 employees ☐

Q6. Briefly can you provide details of the diet or nutrition programmes that are or have been delivered in your place of work? (for example: salt awareness, free fruit at work, healthy vending machines, etc)

……

……

……

……

……

……

Appendix 14: Ethical Approval Letter

Durham University
School of Medicine, Pharmacy and Health

Shaped by the past, creating the future

Dr David Ekers
Clinical Senior Lecturer
Chair, School of Medicine, Pharmacy and Health Ethics Sub-Committee

Sarah Smith
School of Medicine, Pharmacy and Health
Durham University

4th June 2015

Dear Sarah,

Re: Ethics Application ESC2/2015/07
Exploring the components of a successful workplace dietary intervention: learning from the experiences of workplace Health Leads, Health Advocates, and Health Commissioners from the North East Better Health at Work Award

Thank you for sending the above application to the School of Medicine, Pharmacy and Health Ethics Sub-Committee for ethical review. The project was reviewed at a meeting on 22nd April 2015. The committee requested some changes to the application, and I have now reviewed these as Chair. I am satisfied that all of the comments made by the committee have been addressed and I am therefore pleased to confirm Durham University ethical approval for the study.

This approval is given on the following basis:

- Please ensure that data generated for this study is maintained and destroyed as outlined in this proposal and in keeping with the Data Protection Act.
- If you make any amendments to your study, these must be approved by the School committee prior to implementation.

Appendix 15: Completed COREQ checklist for Chapter 3: A Qualitative Study Exploring the Views and Experiences of Delivering Dietary Interventions in Workplaces in the North East of England

COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	81
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	81
Occupation	3	What was their occupation at the time of the study?	81
Gender	4	Was the researcher male or female?	81
Experience and training	5	What experience or training did the researcher have?	81
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	81
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	81
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	n/a
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	81
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	80
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	80
Sample size	12	How many participants were in the study?	81
Non-participation	13	How many people refused to participate or dropped out? Reasons?	81
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	81
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	81
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	84
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	81
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	81
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	81
Field notes	20	Were field notes made during and/or after the inter view or focus group?	81
Duration	21	What was the duration of the inter views or focus group?	81
Data saturation	22	Was data saturation discussed?	82
Transcripts returned	23	Were transcripts returned to participants for comment and/or	81

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	82
Description of the coding tree	25	Did authors provide a description of the coding tree?	n/a
Derivation of themes	26	Were themes identified in advance or derived from the data?	82
Software	27	What software, if applicable, was used to manage the data?	n/a
Participant checking	28	Did participants provide feedback on the findings?	81
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	86
Data and findings consistent	30	Was there consistency between the data presented and the findings?	92
Clarity of major themes	31	Were major themes clearly presented in the findings?	93
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	93

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.

Appendix 16: Food Environment Checklist Developed for this Research

Food Environment Checklist:

Canteen & Mobile Caterers

Observer ID: _____ **Date:** ____ /____ /____ **Day:** _____ **Workplace ID:** _____ **Photographs:** Yes/No

Copy of menu: Yes/No **Time observation started**: _____:_____ **Time ended:** _____:_____

Opening times: Monday to Friday ____:____ to ____:____ Saturday ____:____ to ____:____ Sunday ____:____ to ____:____

Number of tables: _____ **Number of tills in use:** _____ **Takeaway available:** Yes/No

Hot meals provided: Yes/No **Number of hot meal options:** _____ **Evidence of Health Initiatives:** Yes/No (give details below)

Comments:

_____

_____

_____

Facilitators to healthy Eating	**Availability**	**Comments**
Nutritional Information on products/menu	Yes/No	
Traffic light labelling	Yes/No	
Promotions on ‘healthier’ options	Yes/No	
Healthy meal deals	Yes/No	
Smaller portion size option	Yes/No	
Are healthier options positioned prominently?	Yes/No	
Other		
Barriers to Healthy Eating	**Availability**	**Comments**
Promotions to ‘unhealthy’ options	Yes/No	
‘Less healthy’ meal deals	Yes/No	
Large portion sizes encouraged	Yes/No	

All you can eat	Yes/No	
Free refills on drinks/dessert	Yes/No	
Other		

Comparative Pricing	**Availability**	**Comments**
Sum of individual items compared to meal deal	More/Less/Same/NA	
Healthier options compared to regular options	More/Less/Same/NA	
Smaller portion compared to regular portion	More/Less/Same/NA	
Other		

Food Options	**Availability**	**Comments**

Boiled/jacket potatoes offered as a alternative to chips	Yes/No	
Boiled rice offered as an alternative to fried rice	Yes/No	
Pasta dishes with vegetable based sauces (e.g. tomato NOT creamy/cheesy options)	Yes/No	
Burgers served without mayonnaise, cheese, or sauce	Yes/No	
Other meat option served without mayonnaise, cheese, or sauce	Yes/No	
Main dish salads offered	Yes/No	
Main dish salads without creamy/oily dressing	Yes/No	
Side salad /vegetables served with meals	Yes/No	
Oily fish offered (e.g. salmon, fresh tuna)	Yes/No	
Sandwiches, toasties, paninis served without mayonnaise/cheese	Yes/No	
Healthier desserts offered (e.g. fruit salad (including dried fruit), yogurt)	Yes/No	

Heathier snacks offered (e.g. muesli/cereal bars)	Yes/No	
Low fat spreads/margarine (e.g. flora sachet)	Yes/No	
Low salt/sugar condiments (e.g. low salt, reduced sugar ketchup)	Yes/No	
Crisps and other savoury snacks	Yes/No	
Chocolate, confectionary and sweets	Yes/No	
Cakes, muffins, sweet biscuits, scones, pastries, flapjack etc	Yes/No	
Savoury pies and pastries (e.g. sausage rolls, meat pie)	Yes/No	
Sandwiches (including pre-pack and made to order)	Yes/No	
Healthier bread/roll options (e.g. wholemeal, brown)	Yes/No	
Other		
Beverages	**Availability**	**Comments**
Carbonated soft drinks NOT DIET (e.g. coca cola)	Yes/No	

Carbonated soft drinks DIET (e.g. diet coke)	Yes/No	
Fruit juice, added sugar (e.g. cranberry juice, ribena)	Yes/No	
Fruit juice, low or no added sugar (e.g. no added sugar fruit shoot, oasis light)	Yes/No	
Fruit juice and fruit based smoothies (e.g. including from concentrate)	Yes/No	
Milkshakes and dairy based drinks WITHOUT fruit	Yes/No	
Milkshakes and dairy based drinks WITH fruit	Yes/No	
Energy drinks, high sugar (e.g. red bull, Lucozade energy)	Yes/No	
Energy drinks, low sugar (less than 4.5g per 100ml e.g. Lucozade sport)	Yes/No	
Water (bottled) (including flavoured water)	Yes/No	
Water (free) (e.g. tap water, water dispenser)	Yes/No	

Semi-skimmed/skimmed milk for hot drinks (e.g. tea, coffee)	Yes/No	
Low fat hot chocolate	Yes/No	
Alcohol	Yes/No	
Low or no sugar alternatives offered (e.g. sweeteners)	Yes/No	
Other		

Comments: -

Appendix 17: Recruitment Email Sent to Health Advocates

Dear (*insert name*),

Thank you for participating in an interview about workplace dietary interventions back in (*insert month interview took place*). Following on from the information gathered from the interviews, we would like to invite you and your workplace to take part in our study looking at food provision in workplaces. Taking part would involve a researcher visiting your workplace, and conducting observations of what the workforce prefer to purchase and eat whilst at work, from the canteen and any other vendors on site (i.e. mobile caterers/van, vending machines). We would also like to speak to members of the canteen management about their experiences of what the workforce prefer to eat.

Taking part would involve us accessing the worksite canteen and talking to canteen management during a short interview lasting no more than 30 minutes. The research will be completely confidential and fully anonymised. Neither individuals who take part nor the worksite will be named or identifiable.

If you are interested in your workplace taking part, please see the attached information sheet and reply to Sarah Smith via email at **sarah.smith@durham.ac.uk** or telephone **0191 334 0823** (before *insert date*) and she will contact you to arrange a convenient time and location to visit you. We look forward to hearing from you.

Thank you

Appendix 18: Information Sheet for Health Advocates

INFORMATION SHEET

Exploring the workplace food environment

Durham University are inviting your workplace to take part in a study to help identify and explore what food is available to the workforce.

What is the purpose of the study?

We would like to identify what food is available in your workplace (i.e. in the canteen, vending machines) and nearby (i.e. mobile caterers/van, takeaways) to help inform future development of healthy diet initiatives in workplaces in the region.

Why have I been chosen?

All Health Advocates who are part of the Better health at Work Award scheme who took part in an interview with Sarah Smith in 2015 are being contacted to invite your workplace to take part in the project. Taking part is entirely voluntary and it is up to you or your employer whether or not your workplace will take part.

What will taking part involve?

We are asking for you to give permission for a researcher from Durham University to access your workplace canteen on one day during the hours of 11am and 2pm. We would like to identify what food is purchased at the canteen and gather sales data, where available, to determine how many meals the canteen sells versus how many employees bring in food from home or buy food elsewhere. We would also like to speak to members of the workplace canteen management. They will be asked to attend a one-off brief interview, lasting no longer than 30 minutes to hear their views on food provision at workplaces. The questions they will be asked will be specifically on what they perceive to be their 'best seller' in the canteen, and what changes, if any, to food provision they feel would be feasible. We would like to speak to those who use the canteen also. They will be approached in the canteen during lunchtime when they purchase/have eaten their meal and asked to take part in a one-off brief interview lasting no longer than 5 minutes. They will be asked specifically about their food choices in the canteen. All those who agree to take part in an interview will be asked to complete a consent form to confirm that they agree to take part prior to the interview. The interview will take place in private in the canteen, or over the telephone and will be recorded using a

Dictaphone. All the information collected in the interview will be anonymised and kept confidential. We would also like permission to access the worksite on one further occasion to speak to mobile caterers if they are onsite.

What do I have to do?

We would ask you to give us permission for a researcher from Durham University to access the workplace canteen and conduct the interviews with canteen management and canteen users about the food provided in the canteen. Also to speak to mobile caterers that may be onsite.

What are the possible benefits of taking part?

There are no direct benefits to you, however gathering views from your workforce may help to shape future interventions that may help yours and other workplaces in the region to implement dietary change and benefit the wider workforce.

What are the possible risks of taking part?

The purpose of this study is to understand what food is available to the workforce in workplaces across the region. It is unlikely that discussing this will be distressing, but if at any point interviewees don't want to continue they can just ask the researcher to stop the interview.

Do I have to take part?

It is up to you or your employer to decide whether or not to take part. If you decide to give permission to take part, you are free to drop out at any time and without giving a reason. A decision to stop or not to take part will not affect you or your rights as an employee or employer in any way.

What happens when the research stops?

The interview recordings will be transcribed and anonymised, and analysed alongside the sales data collected in the canteen by the researchers at Durham University. Following this the anonymous results will be compiled as part of a PhD thesis and a short summary of the work will be submitted to you. Please let the researcher know if you wish to receive a short summary and you will be contacted again at the end of the study with the results.

Will my taking part in the study be kept confidential?

Yes. All the information collected in the project will be kept confidential. All information collected will be stored in a locked filing cabinet within the School of Medicine, Pharmacy and Health. We will confidentially destroy any personal details about you, your workplace or any participants after 5 years.

Who is organising and funding the evaluation?

The School of Medicine, Pharmacy and Health within Durham University is organising and conducting the study which is part of a PhD project funded by Fuse, the Centre for Translational Research (Further information on Fuse is available at http://www.fuse.ac.uk). This study has been reviewed and approved by Durham University School of Medicine, Pharmacy and Health Ethics committee.

Who should I contact if I have any concerns?

If you have any concerns regarding participation in this study you can contact the lead investigator (Dr Amelia Lake: amelia.lake@durham.ac.uk, 0191 334 0542) and/or the ethics committee chair (Dr Shelina Visram: shelina.visram@durham.ac.uk, 0191 334 0838).

Thank you for taking the time to read the information.

Should you now wish to give permission to take part in the project, we ask that you contact Sarah Smith for further details and to organise a convenient date and time to visit your workplace.

Ms Sarah Smith,
PhD Research Student, Durham University, UK.
Tel: +44 (0)191 334 0823
Email:sarah.smith@durham.ac.uk

Appendix 19: Consent Form for All Participants

Study Number:
Participant ID code:

CONSENT FORM FOR PARTICIPANTS

Exploring the workplace food provision

	Please initial box
I confirm that I have read and understood the information sheet provided for the interview. I have had the opportunity to ask questions and have had these answered satisfactorily.	
I understand that my taking part is voluntary and that I am free to withdraw at any time, without giving a reason.	
I understand that anonymity and confidentiality will be maintained at all times and that my data will be used for the final report and subsequent publications but that I will not be identified.	
I understand that the information I provide will be kept secure in a locked filing cabinet and my personal data will be destroyed after five years.	
I understand that only the researchers will hear what I say in the interview. I agree to being interviewed and for the interview to be recorded.	
I agree to being contacted about this interview and with regards to taking part in further work related to workplace dietary interventions	

Name of participant	Signature	Date

Name of person taking consent	Signature	Date

Appendix 20: Information Sheet for Participants – Workplaces

INFORMATION SHEET

Exploring the workplace food environment

Durham University are inviting your workplace to take part in a study to help identify and explore what food is available to the workforce.

What is the purpose of the study?

We would like to identify what food is available in your workplace (i.e. in the canteen, vending machines) and nearby (i.e. mobile caterers/van, takeaways) to help inform future development of healthy diet initiatives in workplaces in the region.

Why have I been chosen?

Workplaces in the North East are being contacted to take part in the project. Taking part is entirely voluntary and it is up to you or your employer whether or not you will take part.

What will taking part involve?

We are asking for you to give permission for a researcher from Durham University to access your workplace canteen on one day during the hours of 11am and 2pm. We would like to identify what food is purchased at the canteen and gather sales data, where available, to determine how many meals the canteen sells versus how many employees bring in food from home or buy food elsewhere. We would also like to speak to members of the workplace canteen management. They will be asked to attend a one-off brief interview, lasting no longer than 30 minutes to hear their views on food provision at workplaces. The questions they will be asked will be specifically on what they perceive to be their 'best seller' in the canteen, and what changes, if any, to food provision they feel would be feasible. We would like to speak to those who use the canteen also. They will be approached in the canteen during lunchtime when they purchase/have eaten their meal and asked to take part in a one-off brief interview lasting no longer than 5 minutes. They will be asked specifically about their food choices in the canteen. All those who agree to take part in an interview will be asked to complete a consent form to confirm that they agree to take part prior to the interview. The interview will take place in the canteen, or over the telephone and will be recorded using a Dictaphone. All the information collected will be anonymised and kept confidential.

What do I have to do?

We would ask you to give us permission for a researcher from Durham University to access the workplace canteen and conduct the interviews with canteen management and canteen users about the food provided in the canteen.

What are the possible benefits of taking part?

There are no direct benefits to you, however gathering views from your workforce may help to shape future interventions that may help yours and other workplaces in the region to implement dietary change and benefit the wider workforce.

What are the possible risks of taking part?

The purpose of this study is to understand what food is available to the workforce in workplaces across the region. It is unlikely that discussing this will be distressing, but if at any point interviewees don't want to continue they can just ask the researcher to stop the interview.

Do I have to take part?

It is up to you or your employer to decide whether or not to take part. If you decide to give permission to take part, you are free to drop out at any time and without giving a reason. A decision to stop or not to take part will not affect you or your rights as an employee or employer in any way.

What happens when the research stops?

The interview recordings will be transcribed and anonymised, and analysed alongside the sales data collected in the canteen by the researchers at Durham University. Following this the anonymous results will be compiled as part of a PhD thesis and a short summary of the work will be submitted to you. Please let the researcher know if you wish to receive a short summary and you will be contacted again at the end of the study with the results.

Will my taking part in the study be kept confidential?

Yes. All the information collected in the project will be kept confidential. All information collected will be stored in a locked filing cabinet within the School of Medicine, Pharmacy and Health. We will confidentially destroy any personal details about you, your workplace or any participants after 5 years.

Who is organising and funding the evaluation?

The School of Medicine, Pharmacy and Health within Durham University is organising and conducting the study which is part of a PhD project funded by Fuse, the Centre for Translational Research (Further information on Fuse is available at http://www.fuse.ac.uk). This study has been reviewed and approved by Durham University School of Medicine, Pharmacy and Health Ethics committee.

Who should I contact if I have any concerns?

If you have any concerns regarding participation in this study you can contact the lead investigator (Dr Amelia Lake: amelia.lake@durham.ac.uk, 0191 334 0542) and/or the ethics committee chair (Dr Shelina Visram: shelina.visram@durham.ac.uk, 0191 334 0838).

Thank you for taking the time to read the information.

Should you now wish to give permission to take part in the project, we ask that you contact Sarah Smith for further details and to organise a convenient date and time to visit your workplace.

Ms Sarah Smith,
PhD Research Student, Durham University, UK.
Tel: +44 (0)191 334 0823
Email:sarah.smith@durham.ac.uk

Appendix 21: Information Sheet for Participants: Mobile Vendors

INFORMATION SHEET

Exploring the workplace food environment

Durham University are inviting you to take part in a study to help identify and explore what food is available to the workforce in your area.

What is the purpose of the study?

We would like to identify what food is available to workforces in the workplace canteen and in the surrounding area from mobile caterers to help inform future development of healthy initiatives in workplaces in the region.

Why have I been chosen?

As a mobile caterer, you are being contacted to invite you to take part in the project. Taking part is entirely voluntary and it is up to you whether or not to take part.

What will taking part involve?

You would attend a one-off interview, lasting no more than 30 minutes, to hear your views by a researcher from Durham University. You will be asked to complete a consent form to confirm that you agree to take part prior to the interview. The interview will take place in private in your workplace or over the telephone and will be recorded using a Dictaphone. All the information collected in the interview will be anonymised and kept confidential. The questions you will be asked will be specifically on what you perceive to be your 'best seller', and what changes, if any, to food provision you feel would be feasible, acceptable, and affordable to you and your customers. We would also like your permission to visit you one lunchtime to see what food you provide and who from the local workforce buys from you. This visit will be conducted discreetly and will not affect your sales.

What do I have to do?

We would ask you to give us half an hour of your time to allow a researcher from Durham University to conduct the interview with you about food provision, at your place of work, or over the telephone.

What are the possible benefits of taking part?

There are no direct benefits to you, however your views may help to inform and shape future interventions that may help you and other mobile caterers in the region to implement dietary change that may benefit yourselves and customers.

What are the possible risks of taking part?

The purpose of this study is to understand what food is available to the workforce across the region. It is unlikely that discussing this will be distressing, but if at any point you don't want to continue you can just ask the researcher to stop the interview.

Do I have to take part?

It is up to you to decide whether or not to take part. If you decide to take part, you are free to drop out at any time and without giving a reason. A decision to stop or not to take part will not affect you or your rights as a trader in any way.

What happens when the research stops?

The interview recordings will be transcribed and anonymised, and analysed by the researchers at Durham University. Following this the anonymous results will be compiled as part of a PhD thesis. Please let the researcher know if you wish to receive a short summary and you will be contacted at the end of the study with the results.

Will my taking part in the study be kept confidential?

Yes. All the information collected in the project will be kept confidential. All information collected will be stored in a locked filing cabinet within the School of Medicine, Pharmacy and Health. We will confidentially destroy any personal details about you after 5 years.

Who is organising and funding the evaluation?

The School of Medicine, Pharmacy and Health within Durham University is organising and conducting the study which is part of a PhD project funded by Fuse, the Centre for Translational Research (Further information on Fuse is available at http://www.fuse.ac.uk). This study has been reviewed and approved by Durham University School of Medicine, Pharmacy and Health Ethics committee.

Who should I contact if I have any concerns?

If you have any concerns regarding participation in this study you can contact the lead investigator (Dr Amelia Lake: amelia.lake@durham.ac.uk, 0191 334 0542) and/or the ethics committee chair (Dr Shelina Visram: shelina.visram@durham.ac.uk, 0191 334 0838).

Thank you for taking the time to read the information.

Should you now wish to give permission to take part in the project, we ask that you contact Sarah Smith for further details and to organise a convenient date and time to visit your workplace.

Ms Sarah Smith,
PhD Research Student, Durham University, UK.
Tel: +44 (0)191 334 0823
Email:sarah.smith@durham.ac.uk

Appendix 22: Information Sheet for Canteen and Mobile Van Users

INFORMATION SHEET

Exploring the workplace food environment

Durham University are inviting you to take part in a study to help identify and explore what food is available to the workforce in your area.

What is the purpose of the study?

We would like to identify what food is available to workforces and in the surrounding area to help inform future development of healthy initiatives in workplaces in the region.

Why have I been chosen?

As a customer, you are being asked to take part in the project. Taking part is entirely voluntary and it is up to you whether or not to take part.

What will taking part involve?

You will take part in a brief one-off interview, lasting no more than 5 minutes, to hear your views by a researcher from Durham University. You will be asked to complete a consent form to confirm that you agree to take part prior to the interview. The interview will take place now and will be recorded using a Dictaphone. All the information collected in the interview will be anonymised and kept confidential. The questions you will be asked are specifically on what healthy food is available to you, how you identify healthy food provided, and what changes to food provision you feel is desirable, acceptable and affordable to you and other customers.

What do I have to do?

We would ask you to give us a few minutes of your time to allow a researcher from Durham University to conduct the interview with you about food provision here now.

What are the possible benefits of taking part?

There are no direct benefits to you, however your views may help to inform and shape future interventions that may help you and other workers in the region in the future.

What are the possible risks of taking part?

The purpose of this study is to understand what food is available to the workforce across the region. It is unlikely that discussing this will be distressing, but if at any point you don't want to continue you can just ask the researcher to stop the interview.

Do I have to take part?

It is up to you to decide whether or not to take part. If you decide to take part, you are free to drop out at any time and without giving a reason. A decision to stop or not to take part will not affect you or your rights as an employee in any way.

What happens when the research stops?

The interview recordings will be transcribed and anonymised, and analysed by the researchers at Durham University. Following this the anonymous results will be compiled as part of a PhD thesis. Please let the researcher know if you wish to receive a short summary and you will be contacted at the end of the study with the results.

Will my taking part in the study be kept confidential?

Yes. All the information collected in the project will be kept confidential. All information collected will be stored in a locked filing cabinet within the School of Medicine, Pharmacy and Health. We will confidentially destroy any personal details about you after 5 years.

Who is organising and funding the evaluation?

The School of Medicine, Pharmacy and Health within Durham University is organising and conducting the study which is part of a PhD project funded by Fuse, the Centre for Translational Research (Further information on Fuse is available at http://www.fuse.ac.uk). This study has been reviewed and approved by Durham University School of Medicine, Pharmacy and Health Ethics committee.

Who should I contact if I have any concerns?

If you have any concerns regarding participation in this study you can contact the lead investigator (Dr Amelia Lake: amelia.lake@durham.ac.uk, 0191 334 0542) and/or the ethics committee chair (Dr Shelina Visram: shelina.visram@durham.ac.uk, 0191 334 0838).

Appendix 23: Availability of Healthier Alternatives at Workplaces and Price Comparisons

Availability of Healthier Alternatives at Workplaces and Price Comparisons: Workplace Canteen 1

Food or Drink Item	Price	Healthier Alternatives	Price
Soup			
Self-served soup and bread roll	£2.20	Self-served smaller portion Bread roll optional	Same Same
Breakfast Items			
6 item breakfast 10 item breakfast Protein meat items Vegetarian items	£3.25 £4.50 £0.70 £0.50	Beans or eggs on toast	£1.75
Sandwiches			
Freshly made sandwiches Toasted sandwiches	£1.90 - £3.05 £2.75		

Paninis	£3.50	Brown and seeded bread	Same
White bread	£1.90 - £3.05	Pitta bread	Same
		Wraps	Same
Sandwich fillings:			
Tuna mayonnaise	As above	Tuna without mayonnaise	Same
Cheese savoury	As above	Cheese without mayonnaise	Same
With spread	As above	Without spread	Same
Optional mixed salad	As above	With salad	Same
Hot Meals:			
Main dish with side	£4.95	Sides were optional	Same
Main dish with 4 sides	£6.95	Sides included vegetables boiled rice, mixed salad	Same
Vegetarian dish with side	£4.50		
Vegetarian dish with 4 sides	£6.50		
Pizza	£1.95	Alternative hot meals	Various

Sausage roll	£1.00	Alternative hot meals	More
Cheese roll	£1.00	Alternative hot meals	More
Additional sides:			
Large portion of chips	£1.50	Small portion of chips	£1.00
Small portion of chips	£1.00	Vegetables	£1.00
Naan bread	£1.00	Boiled rice	£1.00
		Mixed salad	£1.00
		Jacket potatoes (with filling)	£1.25 (£2.75)
High fat, salt, sugar snacks:			
Confectionary bars, muffins, cakes, pastries	£0.70 - £0.80	Rice cakes	£0.90 - £1.20
		Fresh fruit individuals pieces	£0.50
		Fresh fruit salad	£1.60
Crisps	£0.60	Popchips	£0.85
Yoghurts			
Granola Yoghurts	£1.40	Small plain yoghurt	£0.40

Fruit flavoured yoghurts	£1.40		
Hot drinks:			
Tea Coffee Self-serve hot drinks machine	£1.40 £1.40 £1.00		
Chilled drinks:			
Full fat, non-diet soft drinks Energy drinks Milkshakes	£1.30 £1.40 £0.60	Low fat, diet soft drinks Fresh apple/orange juice Bottled still/sparkling water	£1.30 £1.40 £1.00
Milk:			
		Low fat milk	Free
Sugar:			
Sugar in sachets	Free	Sweetener in sachets	Free
Condiments:			
Table sauces in sachets Salt in sachets	Free Free	Low fat mayo in sachets LoSalt in sachets	Free Free

Availability of Healthier Alternatives at Workplaces and Price Comparison: Workplace Canteen 2

Food or Drink Item	Price	Healthier Alternatives	Price
Soup			
Large soup and grilled sandwich	£3.00	Mug of soup	£1.00
Jacket potatoes:			
Jacket potato with cheese plus an extra filling	£3.50	Plain jacket potato	£2.00
All day breakfast:			
Bacon or sausage or egg sandwich Bacon, sausage, egg sandwich (combination)	£2.00 £2.50	Plain toast with butter Beans or eggs on toast	£1.00 £2.00
Sandwiches:			
Prepacked sandwich Grilled sandwich Roast meat filling and gravy Other grilled sandwiches Burgers (meat and vegetarian)	£2.99 - £3.99 £5.49 £4.99 £4.99	Salads as a main Jacket potatoes	£2.99 - £3.99 £2.00-£3.50

	£4.99		
High fat, salt, sugar snacks:			
Confectionary bars	£0.70 - £0.80		
Chilled drinks:			
Full fat, non-diet soft drinks	£1.50	Low fat, diet drinks	£1.50
Milk:			
		Low fat milk	Free
Sugar:			
Sugar in sachets	Free	Sweetener	Free
Condiments:			
Table sauces in sachets	Free	Low fat options in sachets	Free
Salt and pepper	Free	LoSalt in sachets	Free

Availability of Healthier Alternatives dispensed in Vending Machines at Workplace 1

Food or Drink Item	Price	Healthier Alternatives	Price
Hot drinks:			
Instant coffee Freshbrew coffee Fresh coffee White Extra White Freshbrew tea: White Extra White Chocolate Chocomilk	£0.70 £0.80 £0.80 £0.70 £0.70 £0.70 £0.70 £0.80 £0.80	 Black Black	 Same Same
Sugar:			
Added sugar/Extra sugar	£0.70 £	No sugar	Same
Chilled drinks:			
		Low fat, diet soft drinks only	£1.30
High calorie, fat, salt, sugar snacks:			
Confectionary bars (assorted) Crisps	£0.70 £0.65		

Availability of Healthier Alternatives at External Caterers and Price Comparisons: Mobile Vans

Food or Drink Item	Price	Healthier Alternatives	Price
All day breakfast items			
Large bacon/sausage sandwich		Beans or eggs on toast	
Fried eggs on toast/sandwich		Small bacon/sausage sandwich	
Large poached/scrambled eggs (2 sites) on toast		Small poached/scrambled eggs (2 sites) on toast	
Sandwiches			
Freshly made sandwiches			
Toasted sandwiches			
White bread		Wraps	Same
Sandwich fillings:			
Tuna mayonnaise		Tuna without mayonnaise	Same
Cheese savoury		Cheese without mayonnaise	Same
Seasoned chicken/meat		Plain chicken/meat	Same
With spread		Without spread	Same

Optional salad/garnish		With salad/garnish	Same
Hot Meals:			
Main dish with side Vegetarian dish with side		Sides were optional Sides included boiled rice, mixed salad	Same Same
Additional sides:			
Large portion of chips (all sites)		Small portion of chips (all sites) Boiled rice (3 sites) Mixed salad (all sites) Jacket potatoes with filling (1 site)	
High fat, salt, sugar snacks:			
Confectionary bars, muffins, cakes, pastries (all sites) Crisps		Muesli/cereal bars	

(all sites)			
Hot drinks:			
Tea & Coffee (freshly brewed) (all sites) Hot chocolate (all sites)		Smaller sizes available	Less
Chilled drinks:			
Full fat, non-diet soft drinks (all sites)		Low fat, diet soft drinks (2 sites) Bottled still/sparkling water (all sites)	
Milk:			
Full fat milk/creamer	Varied	Low fat milk/creamer	Same
Sugar:			
Sugar in sachets or pots	Free	No sugar optional	Same
Condiments:			
Table sauces bottled Salt in salt seller	Free Free	No condiments optional	Same

Availability of Healthier Alternatives at External Caterers and Price Comparisons: Restaurants/cafes

Food or Drink Item	Price	Healthier Alternatives	Price
All day breakfast items			
Small breakfast (≤6 items) Large breakfast (≥6 items) Protein meat items Vegetarian breakfast (2 sites) Vegetable items Large bacon/sausage sandwich Fried eggs on toast/sandwich Large poached/scrambled eggs (2 sites) on toast		Beans or eggs on toast 'Guilt free' breakfast (1 site) Small bacon/sausage sandwich Small poached/scrambled eggs (2 sites) on toast	
Sandwiches			

Freshly made sandwiches Toasted sandwiches Panini/toasted sandwich (2 sites) White bread		 Brown bread Pitta bread Wraps	 Same Same Same
Sandwich fillings			
Tuna mayonnaise Cheese savoury Seasoned chicken/meat With spread Optional salad/garnish		Tuna without mayonnaise Cheese without mayonnaise Plain chicken/meat Without spread With salad/garnish	Same Same Same Same Same
Hot Meals:			

Main dish with side Main dish with ≥ 2 sides Vegetarian dish with side Vegetarian dish with ≥ 2 sides Pizza		Sides were optional Sides included vegetables boiled rice, mixed salad 'Guilt free' pizza topped chicken Alternative hot meals	Same Same Less Various
Additional sides:			
Large portion of chips (all sites) Small portion of chips (all sites)		Small portion of chips (all sites) Vegetables (2 sites) Boiled rice (3 sites) Mixed salad (all sites) Jacket potatoes with filling (all sites)	

High fat, salt, sugar snacks:			
Confectionary bars, muffins, cakes, pastries (all sites) Crisps (all sites)		Muesli/cereal bars	
Hot drinks:			
Tea & Coffee (freshly brewed) (all sites) Hot chocolate (all sites) Self-serve hot drinks machine (2 sites)			
Chilled drinks:			
Full fat, non-diet soft drinks (all sites) Milkshakes (2 sites) Smoothies (2 sites)		Low fat, diet soft drinks (2 sites) Fresh apple/orange juice (2 sites) Bottled still/sparkling water (all sites)	

Milk:			
Full fat milk/creamer	Varied	Low fat milk/creamer	Same
Sugar:			
Sugar in sachets or pots	Free	No sugar optional	Same
		Sweetener in sachets	Same
Condiments:			
Table sauces in sachets or bottled	Free	Low fat mayo in sachets	Same
Salt in sachets or salt seller	Free	LoSalt in sachets	Same
		No condiments optional	Same

Appendix 24: Ethical Approval Letter

Durham University
School of Medicine, Pharmacy and Health

Shaped by the past, creating the future

Dr Shelina Visram
Senior Lecturer
Chair, School of Medicine, Pharmacy and Health Ethics Sub-Committee

Sarah Smith
School of Medicine, Pharmacy and Health
Durham University

21 March 2017

Dear Sarah

Re: Ethics Application ESC2/2017/PP06
'Exploring the Broader Workplace Food Environment and the Perceptions of Workplace Food Providers to the Workplace'

Thank you for re-submitting the above application to the School of Medicine, Pharmacy and Health Ethics Sub-Committee for proportionate ethical review. I have reviewed this project on behalf of the Ethics Sub-Committee and as no significant ethical issues were identified, and I am pleased to confirm Durham University ethical approval for the study.

Please do not hesitate to contact me should you have any questions. Good luck, I hope that the study goes well.

With best wishes,

Dr Shelina Visram
Chair

Appendix 25: Completed COREQ checklist for Chapter 4: Exploring the Broader Workplace Food Environment and the Perceptions of Workplace Food Providers

COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	107
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	107
Occupation	3	What was their occupation at the time of the study?	107
Gender	4	Was the researcher male or female?	107
Experience and training	5	What experience or training did the researcher have?	107
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	107
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	107
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	n/a
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	107
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	101 and 107
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	107
Sample size	12	How many participants were in the study?	109
Non-participation	13	How many people refused to participate or dropped out? Reasons?	109
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	107
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	107
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	101
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	107
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	107
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	107
Field notes	20	Were field notes made during and/or after the inter view or focus group?	107
Duration	21	What was the duration of the inter views or focus group?	n/a
Data saturation	22	Was data saturation discussed?	n/a
Transcripts returned	23	Were transcripts returned to participants for comment and/or	107

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	108
Description of the coding tree	25	Did authors provide a description of the coding tree?	n/a
Derivation of themes	26	Were themes identified in advance or derived from the data?	123
Software	27	What software, if applicable, was used to manage the data?	n/a
Participant checking	28	Did participants provide feedback on the findings?	107
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	120-125
Data and findings consistent	30	Was there consistency between the data presented and the findings?	120-125
Clarity of major themes	31	Were major themes clearly presented in the findings?	120-125
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	120-125

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.

Appendix 26: Description of Foods and Beverages available

Description of Foods and Beverages available Workplace 1

There were a variety of hot and cold food options available at the canteen. Prepacked chilled sandwiches, Paninis and sandwiches for toasting were in fridges for customers to select from. Alongside the sandwich options, fruit yogurts and yoghurts with granola toppings were available, next to fresh cartons of semi-skimmed milk. In a separate fridge, chilled soft drinks were available. These were bottles of both full fat and low-fat diet drinks, bottled water and milk.

Directly opposite the fridges containing the chilled goods was the counter where hot food items were displayed and served to customers by canteen staff. There were many more hot food options available than chilled, and the menu changed daily. There was a stir fry area where customers could pick their vegetables plus either a meat or meat alternative, upon which a chef cooked the stir fry and served it. This was a popular choice on the day.

Alongside this was a self-serve station for soup. The soup option changed daily, and the customer could opt to include additional extras or not, which included croutons, seed toppings, and a bread roll with butter or spread in individual sachets. Alongside the soup station was the main hot food counter.

There were four hot meal options, including a vegetarian option, and optional sides. A selection of freshly prepared vegetables was available as a side and placed alongside the other options which included chips, potato wedges, and potatoes (boiled and jacket), pitta breads, rice and a salad bar and prepacked salads were available. The canteen staff serving at the hot food counter referred to the vegetables when mentioning the optional accompaniments of the hot meals to the customer.

A salad and sandwich bar which also served jacket potatoes, offered a selection of fillings, both hot and cold, and various bread roll options, including wholemeal and seeded. There were healthier alternatives offered for most

options such as plain tuna as well as tuna mayonnaise, plain cheese as well as cheese savoury. The salad bar was extensive and included fresh produce that was replenished daily.

Fresh fruit was placed prominently in the establishment, on the top shelf of the first stand passed on entry to the canteen. This was placed above crisps of which there was much wider selection compared to the fruit on offer. In addition, pre-packed fruit salads were available in the nearby refrigerators.

There was a self-service drinks station for tea, coffee and hot chocolate, with low fat milk and creamer options. High calorie and high fat snacks, except crisps, were positioned next to a self-service drinks station, where people are likely to pick up a snack that compliments their hot beverage (cakes, biscuits, muffins etc). Confectionary bars were displayed in raised stands and featured heavily by the tills. Condiments were in individual sachets and were located on entry/exit from the food area, with low fat, low salt options available. All food options, hot or chilled were available to eat in or takeaway.
This canteen also catered for larger events of up to 100 persons and formal dining options. There was a range of seating in this establishment that could seat 100 plus people, and included large circular tables seating 10 people, with smaller traditional canteen tables and chairs.

There were three visible promotions at the workplace canteen to buy food items and drink in a meal deal for a price lower than that of the food items sold separately. These included '*bacon/sausage bu*n' deal with hot drink, *'breakfast deals with a hot drink for an extra £1.00'*, and a sandwich deal '*with fruit or crisps or chocolate bar and drink'*. All food options, hot or chilled were available to eat in or takeaway, with takeaway options charged at a lower price.

Description of Foods and Beverages available Workplace 2

The canteen at Site 2 was open from the hours of 08:00 to 14:00 weekdays and 11:00 to 14:00 on weekends. The options at this site were from a fixed menu, except for the sandwiches and salads which were replenished daily. All day breakfast was offered, with fried goods such as bacon, sausages, eggs (priced at £2.00 per food item, £2.50 for two items, or £3.00 for three items in combination), and healthier 'light' alternatives such as eggs or beans on toast (priced at £2.00) and plain toast with butter (priced at £1.00). For an extra £1.00 a cup of coffee could be added to the breakfast options before 11:30am. There did not appear to be any alternatives to butter such as lighter spreads.

Grilled sandwiches were a speciality and offered on their own or with a side. Interestingly the 'side' was a jacket potato or soup, but there was no side salad option. This option was priced from £3.99 to £5.99 with carved roasted meat joint filling (with gravy) costing most and the vegetarian cheese grilled sandwich the cheapest. Pre-packed sandwiches, including a vegetarian option were available (£2.99 to £3.99), and salads as a main (£2.99 to £3.99) were available ready made in the fridge for customers to select.

Burgers were available to buy priced at £4.99, and included beef, chicken, pulled pork, and vegetarian. The choice of soup changed daily and was available as either a smaller serving in a mug (£1.00) or as a 'large bowl' with grilled sandwich accompaniment (£3.00). Jacket potatoes were offered either plain (priced at £2.00) or with a filling of cheese and either pulled pork (£3.50) or beans or coleslaw (£3.00) or with a grilled sandwich.

High calorie and high fat snack items such as crisps and confectionary bars were available and were positioned prominently in a raised stand at the start of the counter queue, before any other options. This was next to condiments, which were available in large bottles to share, not individual sachets, and salt and pepper. There was no fresh fruit or other alternatives to confectionary bars.

There was an extensive hot drinks menu, offering tea, different variations on coffees, with syrups and creamer, and hot chocolate. Sugar and sweetener was available to add to drinks when they were served to the customer at a self-serving station. Drinks were not offered in china but in disposable cardboard or plastic cups with optional lids. Soft drinks and water were available to purchase in bottles from fridges, and included diet versions, fruit juice and readymade pre-bottled smoothies.

There was one visible promotion at the workplace canteen to buy a grilled sandwich and drink for a price lower than that of the food items sold separately. All food options, hot or chilled were available to eat in or takeaway.

This canteen also offered a delivery or collections service for platters for larger catering requests. These options were extensive and included fruit skewers, vegetarian quiche, crudités and houmous, grilled and non-grilled sandwiches, rolls, other savoury snacks (such as sausage rolls, pork pies and chicken goujons) as well as cakes. This menu was far more extensive than that offered in the canteen itself, which may suggest that these options were not in demand day-to-day, which could reflect the type of worker accessing this canteen; predominantly tradesmen and catering and other retails establishment workers (managerial and catering staff) stocking up on goods, with little time to sit down and eat. Hence offering soup in a mug, food as a takeaway option, foods and drinks that are portable.

There was a range of seating in this establishment that could seat 30 plus people, and included small leather sofas and armchairs, and more traditional canteen tables and chairs.

Description of Foods and Beverages available Mobile Vans

The mobile vans offered between 2 and 5 hot meal options. All the vans observed provided meat burgers, processed meats (bacon, sausages), savoury pies, sandwiches (both freshly made and pre-packed) made on white bread only. Chocolate, confectionary, crisps, cakes were also on sale. Two vans provided main dish salads, and one van provided jacket potatoes, boiled rice, pasta dishes with vegetable sauce, quiche, wraps, and omelette.

Bestsellers were burgers, hot sandwiches (white bread, bacon, sausages), meat pies and salad boxes. The vans used full fat spreads and condiments. Larger portions sizes were encouraged by caterers own admission.

Most of the vans did not offer any meal deals, two did offer less healthy meal deals and promotions on boards which were less than the sum of individual items examples of which included *'sandwich and any filling with a drink £1.00'*, *'cheeseburger, chips and drink £3.00'* which were prominently positioned on the van counter.

There was some seating provided by the vans, consisting of two plastic chairs on the roadside or a picnic bench seating 4 people. There was a steady flow of customers to the mobile vans with an average of 10 people purchasing items during the observation time.

The drive by van did not have cooking facilities therefore only sold pre-packed yet still homemade items, including main dish salads, sandwiches and savoury pies. Muesli and cereal bars were provided alongside confectionary, chocolate, crisps and cakes. No hot drinks were sold from the van. Both diet and non-diet carbonated soft drinks including energy drinks, and bottled water were available. Small cartons of low fat milk were available. Music was playing from the van also, and there was a queue of 10 people waiting to be served, predominately salespersons from car showrooms in the vicinity.

Description of Foods and Beverages available Restaurants/cafes

There were a variety of hot and cold food options available at the restaurants/cafes in industrial units. Hot and cold sandwiches with a choice of brown or white bread options were freshly made up per customer. Sandwiches for toasting, if available, were in fridges for customers to select from.

In the majority of establishments, the chilled goods were in close proximity to the counter where hot food items were displayed and served to customers by catering staff. Many more hot food options were available than chilled, and the menu saw daily changes for specials but the rest was unchanged. In two of the establishments hot food was chosen from a blackboard menu and was prepared to order, so no hot options were on display at all. In the other establishments, there was a combination of both a hot food counter to view items, and other meals were prepared out of sight in the kitchen area.

There were between 4 and 6 hot meal options, with at least one vegetarian option, and optional sides. Freshly prepared vegetables were lacking but a side salad was available at the majority of establishments, and placed alongside the other options which included chips, jacket potatoes and rice. Salads as a main were offered at two establishments. The canteen staff were willing and happy to accept special requests, such as the omission of or inclusion of foods from set meals, usually at no extra cost.

Chilled soft drinks were available in fridges, the majority of which were bottles and cans of both full fat and low-fat diet drinks, bottled water and occasionally milk. If milk was not sold in cartons the staff provided glasses of milk on request. One establishment did not provide low-fat or diet versions of soft drinks, and their soft drinks selection overall was limited to only two brands.

In most restaurants/cafes hot drinks such as tea and coffee were prepared by the staff and customers used a self-service station for milk and creamer options for hot drinks and sugar. It was not clear if low fat milk options were

always offered as the milk was usually dispensed from a jug rather than the carton. In one establishment a hot drinks vending machine was used for tea, coffee, and hot chocolate.

High calorie and high fat snacks, including crisps, were in prominent positions on top of the counters or at eye level where people are likely to pick up a snack that compliments their hot beverage (cakes, biscuits, muffins etc) and featured heavily by the tills. There was no evidence of cereal or muesli bars, but confectionary was provided at each establishment. One provided only two options, whilst the rest provided several.

Condiments were either in individual sachets or in bottles and were located at a self-serve station, with no evidence of low fat options. There were promotions for unhealthy meal deals including breakfast options, such as bacon or egg roll and coffee, or a burger and chips with a hot drink. In all instances the meal deal was cheaper than the sum of individual items. All food options, hot or chilled were available to eat in or takeaway.

The types of food and drinks purchased during the observation were predominantly all-day breakfasts, jacket potatoes, and sandwiches (optional brown bread) at restaurants/cafes. The majority of customers were eating in and took up seats in the establishment.

Appendix 27: Choice Architecture Interventions Identified in All Sites

Choice Architecture Interventions in Workplace Canteens

Corresponding Photograph (bold) and Description of Observation	Typology of Choice Architecture Interventions in Micro-environments
Workplace Canteen Site 1	
A Provision of fresh fruit.	**AVAILABILITY**: add behavioural options within a given micro-environment
A Prominent positioning, next to the entrance, with a variety of fresh fruit on the top shelf at eye level.	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort **PROMPTING**: use non-personalised information to promote or raise awareness of a behaviour
A Fruit display is attractive, greengrocer style marketing/association.	**PRESENTATION**: alter sensory qualities or visual design of the product

A Fruit is directly above the packets of crisps and popcorn.	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort **PROMPTING**: use non-personalised information to promote or raise awareness of a behaviour
B Pre-packed sandwiches with traffic light food labelling	**LABELLING**: apply labelling or endorsement information to product or at point of choice
B Selection of healthier alternative desserts i.e. fruit salad, yogurt with granola or plain fruit flavoured yogurt. **B** Fruit salad and granola yogurts in attractive packaging	**AVAILABILITY**: add behavioural options within a given micro-environment **PRESENTATION**: alter sensory qualities or visual design of the product
C Layout of the canteen is such that the user is lead past hot meals and steered through to less healthier snacks.	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort

	FUNCTIONAL DESIGN: design or adapt equipment or function of the environment
D High calorie, high fat snacks such as cakes, muffins, chocolate bars and flapjacks next to tea/coffee/hot beverage self-service facilities.	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort **AVAILABILITY**: add behavioural options within a given micro-environment (coffee machine area is the micro-environment within the micro-environment)
D Payment/cashier desk heavily laden with high calorie, high fat snacks, prompts at point of sale purchase.	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort **PROMPTING**: use non-personalised information to promote or raise awareness of a behaviour
D Artwork on the wall depicting high calorie snacks	**PRIMING**: place incidental cues in the environment to influence a non-conscious behavioural response

	AMBIENCE: alter aesthetics or atmospheric aspects of the surrounding environment
B Food packaging has nutritional labelling	**LABELLING**: apply labelling or endorsement information to product or at point of choice
? Low fat, sugar, salt alternatives for drinks or condiments	**AVAILABILITY**: add behavioural options within a given micro-environment **PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort
? Providing seating, tables, armchairs, sofas	**AMBIENCE**: alter aesthetics or atmospheric aspects of the surrounding environment **FUNCTIONAL DESIGN**: design or adapt equipment or function of the environment

Choice Architecture Interventions Identified in Workplace Canteen Site 2

Workplace Canteen Site 2	
? Layout of the canteen is such that the user is steered directly to high calorie snacks first.	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort **FUNCTIONAL DESIGN**: design or adapt equipment or function of the environment
? High calorie, high fat snacks such as cakes, muffins, chocolate bars and flapjacks next to tea/coffee/hot beverage self-service facilities.	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort **AVAILABILITY**: add behavioural options within a given micro-environment (coffee machine area is the micro-environment within the micro-environment)
? Payment/cashier desk heavily laden with high calorie, high fat snacks, prompts at point of sale purchase.	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort

	PROMPTING: use non-personalised information to promote or raise awareness of a behaviour
? Artwork on the wall depicting high calorie foods	**PRIMING**: place incidental cues in the environment to influence a non-conscious behavioural response **AMBIENCE**: alter aesthetics or atmospheric aspects of the surrounding environment
? Food packaging has nutritional labelling	**LABELLING**: apply labelling or endorsement information to product or at point of choice
? Menus on the tables	**PRIMING**: place incidental cues in the environment to influence a non-conscious behavioural response **PROMPTING**: use non-personalised information to promote or raise awareness of a behaviour
? Name of the canteen is a food item	**PRIMING**: place incidental cues in the environment to influence a non-conscious behavioural response

	PROMPTING: use non-personalised information to promote or raise awareness of a behaviour
? Low fat, sugar, salt alternatives for drinks or condiments	**AVAILABILITY**: add behavioural options within a given micro-environment **PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort

Choice Architecture Interventions Identified in Mobile Catering Vans

Description of Observation	Typology of Choice Architecture Interventions in Micro-environments
Mobile Catering Vans	
Position of the van on quieter side streets with roadside parking available, short walking distance from workplaces. Can be accessed on foot and by vehicle.	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort **FUNCTIONAL DESIGN**: design or adapt equipment or function of the environment
The mobile caterers were pitched in the same location or drove to the same worksites	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort **FUNCTIONAL DESIGN**: design or adapt equipment or function of the environment
Mobile vans that drive to the workplace	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort

	FUNCTIONAL DESIGN: design or adapt equipment or function of the environment
Layout of the van hatch is such that the user can see all the food items and beverages whilst stationary (as opposed to walking round the canteen facilities)	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort **FUNCTIONAL DESIGN**: design or adapt equipment or function of the environment
High calorie, high fat snacks such as chocolate bars and potato crisps next to tea/coffee/milk self-service facilities immediately inside the hatch of the van.	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort **AVAILABILITY**: add behavioural options within a given micro-environment (coffee machine area is the micro-environment within the micro-environment)
Salt sellers and condiments immediately inside the hatch of the van or on tables with seating	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort

	AVAILABILITY: add behavioural options within a given micro-environment (coffee machine area is the micro-environment within the micro-environment)
Displays at eyelevel of high calorie, high fat snacks, and prompts at point of sale purchase.	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort **PROMPTING**: use non-personalised information to promote or raise awareness of a behaviour
Low fat, sugar, salt alternatives for drinks or condiments	**AVAILABILITY**: add behavioural options within a given micro-environment **PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort
Providing seating and tables	**AMBIENCE**: alter aesthetics or atmospheric aspects of the surrounding environment

	FUNCTIONAL DESIGN: design or adapt equipment or function of the environment
Menus on the hatch or blackboard	**PRIMING**: place incidental cues in the environment to influence a non-conscious behavioural response **PROMPTING**: use non-personalised information to promote or raise awareness of a behaviour

Choice Architecture Interventions Identified in Restaurants/Cafes in Industrial Sites

Restaurants/Cafes in Industrial Units	
Position of the restaurant/cafe on quieter side streets with roadside or car parking available, short walking distance from workplaces. Can be accessed on foot and by vehicle.	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort **FUNCTIONAL DESIGN**: design or adapt equipment or function of the environment
Layout of the restaurant/cafe is such that the user is steered directly to high calorie snacks first.	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort **FUNCTIONAL DESIGN**: design or adapt equipment or function of the environment
High calorie, high fat snacks such as cakes, muffins, chocolate bars and flapjacks next to tea/coffee/hot beverage self-service facilities.	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort

	AVAILABILITY: add behavioural options within a given micro-environment (coffee machine area is the micro-environment within the micro-environment)
Payment/cashier desk heavily laden with high calorie, high fat snacks, prompts at point of sale purchase.	**PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort **PROMPTING**: use non-personalised information to promote or raise awareness of a behaviour
Artwork on the wall depicting high calorie foods	**PRIMING**: place incidental cues in the environment to influence a non-conscious behavioural response **AMBIENCE**: alter aesthetics or atmospheric aspects of the surrounding environment
Menus on the tables	**PRIMING**: place incidental cues in the environment to influence a non-conscious behavioural response

	PROMPTING: use non-personalised information to promote or raise awareness of a behaviour
Name of the canteen is related to food	**PRIMING**: place incidental cues in the environment to influence a non-conscious behavioural response **PROMPTING**: use non-personalised information to promote or raise awareness of a behaviour
Low fat, sugar, salt alternatives for drinks or condiments	**AVAILABILITY**: add behavioural options within a given micro-environment **PROXIMITY**: make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort
Providing seating, tables, armchairs, sofas	**AMBIENCE**: alter aesthetics or atmospheric aspects of the surrounding environment **FUNCTIONAL DESIGN**: design or adapt equipment or function of the environment